DOCUMENT RESUME

ED 317 768 CE 054 513

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TITLE	Integrating Quality Concepts into TAFE Courses.
INSTITUTION	TAFE National Centre for Research and Development, Ltd., Leabrook (Australia).
SPONS AGENCY	Australian Dept. of Industry, Technology, and Commerce, Canberra.
REPORT NO	ISBN-0-86397-285-3
PUB DATE	89
NOTE	143p.
AVAILABLE FROM	TAFE National Centre for Research and Development, 252 Kensington Road, Leabrook South Australia 5068, Australia.
PUB TYPE	Reports - Research/Technical (143)
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Continuing Education; Course Content; *Curriculum Development; Curriculum Guides; Engineering; Foreign Countries; Hospitality Occupations; *Integrated Curriculum; Manufacturing; Models; Office Occupations; *Quality Control; Sheet Metal Work; Technical Education; Vocational Education
IDENTIFIERS	*Australia; Customer Satisfaction; TAFE (Australia)

ABSTRACT

This document contains the written outcomes from a 1988 project designed to result in the development and integration of instruction on quality into existing Australia's technical and further education (TAFE) courses. The document is intended for TAFE senior staff, staff developers, teaching staff, and curriculum developers; and senior management in industry, unions, and government departments. Following an introduction, the second section explains what constitutes quality, discusses key principles, lists the benefits of integrating quality into TAFE courses, and lists requirements for successful integration. Section 3 describes a study on quality that involved interviews in 40 firms. Section 4 makes policy suggestions regarding curriculum development, accreditation-reaccreditation, and staff development. Section 5 provides a framework for curriculum development. To illustrate that integration, Section 6 provides pilot curricula in a trade certificate course in sheet metal, an associate diploma course in mechanical engineering, and a short course in hotel bar supervision. Section 7 describes the types of materials that would be suitable for teaching modern quality concepts in existing TAFE courses. Descriptions are provided of training packages that teach the key principles of quality, the key principles applied to office administration, and the key principles applied to manufacturing. Section 8 provides an agenda for an 8-hour workshop to explain the document's principles to staff. Twenty-three references are included. Appendices contain a list of project advisors, information on existing courses on quality, and existing resources on quality. (The industry survey report and the video training package are not included.) (CML)

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TAFE

TAFE NATIONAL CENTRE FOR RESEARCH AND DEVELOPMENT

INTEGRATING QUALITY CONCEPTS INTO TAFE COURSES

U.S. DEPARTMENT OF EDUCATION
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This project was commissioned by the National Industry Extension Service, Commonwealth Department of Industry, Technology and Commerce.

Adelaide
1989

CE054513

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ISBN 0 86397 285 3 (Hard Copy)
TD/TNC 18.02

Typed by: Jean Williams

Published By:
TAFE National Centre for
Research and Development
296 Payneham Road
Payneham SA 5070
(Incorporated in South Australia)

Printed by D. J. Woolman, Government Printer, South Australia

FOREWORD

The TAFE National Centre for Research and Development was commissioned by the Department of Industry, Technology and Commerce (DITAC) to develop curricula on 'Quality' for integration into existing TAFE courses. The Department's National Industry Extension Service (NIES) funded the project. The project had the support of the Conference of TAFE Directors' Sub-committee, the Australian Committee for TAFE Curriculum (ACTC).

In addition to this final report, the other project outcomes are:

- a brochure on the project;
- a report of the industry survey;
- a summary of the industry survey report;
- a set of three videos with student and teacher notes;
- a summary of this report;
- one day workshops in Australian capital cities in July and August, 1989.

A separate (but related) national project on 'Quality courses and resources', funded by ACTC, has been undertaken by Queensland TAFE in 1988-89.

The Centre would like to acknowledge the financial support and helpful advice provided by DITAC. In addition, very valuable support was given by the Project Advisory Committee which comprised the Education Task Group of the NIES Quality Forum, the project leader, and a representative of the ACTC. The members of the Project Advisory Committee are listed in Appendix A.

One of the project team, Andrew Inglis, was seconded from Griffin Press Ltd and thanks are due to them for their help. The Centre also acknowledges the help of the manufacturing and hospitality organisations that participated in the industry survey. The authors would like to thank David Lewis (TAFE NSW), Jon Magritzer (AOQ), and many other colleagues in TAFE and industry for providing valuable comments on the draft final report.

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ABBREVIATIONS

ABS	Australian Bureau of Statistics
ACTC	Australian Committee on TAFE Curriculum
AGPS	Australian Government Publishing Service
AMT	Advanced manufacturing technology
AOQ	Australian Organisation for Quality (Formerly AOQC)
ASCO	Australian Standard Classification of Occupations
ASIC	Australian Standard Industrial Classification
CAD	Computer-aided design
CAM	Computer-aided manufacturing
CIM	Computer-integrated manufacturing
DITAC	Department of Industry, Technology and Commerce
FMS	Flexible manufacturing system
GDP	Gross domestic product
JIT	Just-in-time
MRP II	Manufacturing resources planning
NIES	National Industry Extension Service
SA	Standards Australia (formerly SAA)
SQC	Statistical quality control
TAFE	Technical and further education
TQC	Total quality control
TQM	Total quality management
VAM	Value added manufacturing

1. INTRODUCTION

In 1988 the Department of Industry, Technology and Commerce (DITAC) commissioned the TAFE National Centre for Research and Development in to undertake a project entitled: Curriculum Development to Meet Industry Needs for Quality. The project is based on a conclusion of the Foley Report (1987), that quality issues are at the heart of Australia's economic problems, and that modern approaches to management for quality and improvement require <u>all</u> people within enterprises to be responsible for quality.

The aims of the project were to:

- research the needs of industry with regard to skills in quality management and the existing formal training courses;
- design curriculum components in quality management which can be integrated into existing TAFE courses;
- develop materials for use in the curriculum components referred to above;
- disseminate to TAFE authorities and TAFE colleges information on the curriculum components and curriculum materials developed;
- make every reasonable effort to ensure acceptance by TAFE colleges of the materials developed under this agreement, principally by liaising with state TAFE authorities and the Australian Committee on TAFE Curriculum;
- evaluate the effectiveness of the curriculum components and curriculum materials produced.

It is important to note from these aims that the project was not concerned with developing separate 'stand alone' quality courses for quality specialists. The central thrust of the project is the integration of modern quality concepts, applicable to industry, into existing TAFE vocational courses. This task is a substantial one, having major implications for curriculum development and staff development in TAFE.

Also, the project was not concerned with the quality of TAFE or its courses and teaching. The quality concepts discussed in this report may, of course, be applied to any organisation - including a TAFE college, but this was not a concern of the project.

The main project was begun in July, 1988 and was completed in December, 1988. Workshops will be conducted and further dissemination of reports will occur in 1989. The project team included Bill Hall, Geoff Hayton, Kevin Neylon, Andrew Inglis and Maurice Hayes. The project was guided by an advisory committee consisting of the NIES Task Force on Quality Education and a representative of the Australian Committee on TAFE Curriculum.

To achieve the project aims, the following activities were undertaken as part of the project:

- conducting a targeted interview survey of selected manufacturing and tourism/hospitality organisations in Queensland, New South Wales, Victoria and South Australia to identify training needs in quality (a summary of the results is presented in Chapter 3);

- establishing a network of people interested in quality in TAFE and industry, including the professional quality associations and the NIES Task Force on Quality Education (which acted as the advisory committee for the project);

- liaising with the TAFE authorities and the Australian Committee on TAFE Curriculum (ACTC) through the Centre's Liaison Officers in each authority and through a representative of the ACTC nominated for this purpose;

- liaising with the Queensland TAFE project team undertaking an ACTC national curriculum project on quality curricula and resources;

- developing a curriculum framework for integrating quality into existing TAFE vocational courses (see Chapter 5);

- developing curriculum components for use in pilot projects in four TAFE courses, with some sample teaching notes (see Chapter 6);

- developing curriculum materials comprising three video training packages for use in the curriculum components referred to above, including teaching notes and student notes (see Chapter 7);

- disseminating information to TAFE authorities and TAFE colleges on quality and the quality components and materials through distribution of brochures, reports and the conduct of workshops;

- preparing, arranging and conducting workshops for TAFE staff in Brisbane, Sydney, Melbourne, Adelaide and Perth (see Chapter 8).

This report, with appendices, contains all the main written outcomes from the project, and was prepared for the Department of Industry, Technology and Commerce. The main audience for this report is curriculum developers in TAFE. Sections of this report should be of use to other groups as follows:

. Senior management in industry, unions and government departments	: Chapters 1 to 3;
. Senior TAFE staff	: Chapters 1 to 4;
. TAFE staff developers	: Chapters 1 to 4 and 8;
. TAFE teaching staff	: Chapters 1 to 5, 7 and Appendices C,D,E,F, G.

2. PHILOSOPHY - WHY INTEGRATE QUALITY INTO TAFE COURSES?

2.1 WHAT IS QUALITY?

> The Prime Minister of Australia, Bob Hawke, stressed the importance of quality with the following statement:
>
> Back in 1950 Japan's leading companies got together to do something about their country's image for poor quality products. They succeeded so well that Japan's image is now just the opposite and (Japan) is one of the most prosperous countries in the world.
>
> We need a change like that in Australia today. Unhappily Australian industry has tended to lag behind that of our overseas competitors in recent years and we are overdue to catch up, but it is essential that we do (catch up) if we are able to win a better standard of living and better job prospects for ourselves and for the next generation.
>
> The Hon R.J.L. Hawke
> Prime Minister
> 2 April 1984
> (Foley 1987, p.1)

Quality issues are at the heart of Australia's economic problems and the Foley Report recommended that:

> The Commonwealth Government, through the Departments of Education and Industry, Technology and Commerce, in consultation with State Departments of Education, industry and the ACTU, undertake a detailed study of the education and training requirements of industry in respect to quality matters including the need for secondary and tertiary institutions (particularly TAFEs) to offer courses to train the workforce in quality issues, including quality management concepts, principles and practice. (Foley 1987, p.9).

It is necessary to understand what quality is and then look at it from an historical perspective. The report will have little meaning in TAFE unless viewed in this context. It focuses on integrating quality into the curriculum of all courses and does not infer or question the quality of TAFE itself. The differences in premises, concepts and even meaning of the word *quality* need to be clarified. Otherwise, the concept of integrating quality into all courses is misleading. Most curriculum documents include a section on QUALITY STANDARDS or QUALITY CONTROL for courses. That's not the *quality* we are talking about.

The desirable standards of quality and service are reached by tangible improvements and attitudinal changes. Furthermore, everyone needs to be involved in managing for quality. Improvements in quality are critical to increasing the well-being of people, as well as contributing to Australian industry's economic recovery and competitiveness.

> Quality is a customer determination, not an engineer's determination, not a marketing determination, or a general management determination. It is based upon the customer's actual experience with the product or service, measured against his/her requirements - stated or unstated, conscious or merely sensed and always represents a moving target. (Feigenbaum 1983, p.10).

Robson states:

> 'Quality is meeting customer requirements, now and in the future'. (Robson 1986, p.69).

Quality has dual meanings relating to:

- product/service features;
- freedom from deficiencies or waste/variation.

Both of the aspects suggested above are implied in a TOTAL approach to QUALITY. It means meeting customer expectations now and in the future and equally, the elimination of waste, deficiencies and variation.

The report uses the phrase ***Managing for Quality and Improvement*** to embrace a total approach to quality. It is also important to understand some other terms in relation to quality.

Total Quality Control is the application of statistical (and charting) principles and techniques in all stages of design, production, service, marketing and administration to achieve disruption - and error-free activities that produce defect-free products and services at a quality and cost suited to the market, and with dependable delivery.

Improvement is the 'organised creation of beneficial change for the attainment of unprecedented levels of performance' (Juran 1988).

2.1 THE MEANING OF 'QUALITY'

Reaching agreement on what is meant by quality is not simple. The dictionary lists about a dozen definitions. For managers, no short definition is really precise, but one definition has received wide acceptance:

'Quality is fitness for use'.

This definition provides a short, comprehensive label, but it does not provide the depth needed by managers to enable them to choose courses of action. On closer examination we discover that 'fitness for use' branches out in two rather different directions, but both directions demonstrate aspects of quality. These two aspects are outlined in Table 2.1.

TABLE 2.1: THE TWO ASPECTS OF QUALITY (Juran 1988)

PRODUCT FEATURES WHICH MEET CUSTOMER NEEDS	FREEDOM FROM DEFICIENCIES
Higher quality enables companies to:	Higher quality enables companies to:
. increase customer satisfaction;	. reduce error rates;
. make products saleable;	. reduce rework, waste;
. meet competition;	. reduce field failures, warranty charges;
. increase market share;	
. provide sales income;	. reduce customer dissatisfaction;
. secure premium prices;	. reduce inspection, test;
	. shorten time to put new products on the market;
Usually, higher quality costs more.	. increase yields, capacity;
	. improve delivery performance;
	Usually, higher quality costs less.

(Juran, 1988)

Table 2.1 helps to explain why so many meetings held to discuss managing for quality have ended in confusion. Some managers literally did not know what others were talking about because the same word - quality - seems to have a dual meaning.

Managing is defined as having 'effective control of' and so concerns everyone in an organisation from the manager to the operator.

A Customer is anyone who is impacted by the product or process. Customers may be external or internal. It is fundamental to TAFE curriculum development in quality to recognise customer requirements now, and in the future. TAFE needs to know what industry and students (external customers) want, and as a consequence provide the necessary training to satisfy these needs. For TAFE staff, other staff within the college or TAFE 'head office' may be internal customers. Understanding and satisfying their needs is the basis for improving the effectiveness of the whole organisation.

Quality then, cannot be neatly defined or packaged as a course. Managing for Quality and Improvement is a new approach towards continuous improvement; meeting customer requirements, and eliminating waste and variation involves everyone in an organisation. It will also require 'cultural change' within organisations involving' changes in attitudes towards other people, and TAFE has a significant role in influencing behaviours through its programmes.

Other concepts expressed as acronyms such as TQC (Total Quality Control), TQM (Total Quality Management), QC (Quality Circles), SPC (Statistical Process Control), JIT (Just-in-Time), VAM (Value Added Manufacturing) are all strategies designed for quality and improvement. These have been implemented predominantly in the manufacturing sector but have significant application for service industries. 'Service Excellence' approaches in service industries parallel many of these quality strategies. However, we need to look beyond the jargon to identify philosophies behind these approaches.

The curriculum should not adopt any one approach but recognise that a total view towards quality is essential. Similarly, there are many quality practitioners such as Shewhart, Deming, Juran, Feigenbaum and Ishikawa who have contributed greatly to the field. Their contributions should be recognised and should be reflected in the curriculum. However, it is suggested here that the focus should be on eight key principles of managing for quality and improvement. These were endorsed by the National Quality Forum's Education Task Force which comprised representatives from government, industry and education. The strategy is national and a common set of principles will be the foundation for curriculum development and training within TAFE, CAEs and universities in Australia.

2.3 HISTORICAL BACKGROUND

The basis for modern approaches to Quality Management was developed by Dr W. Shewhart of the Bell Laboratories (USA) by using statistical tools in order to provide more effective means of process quality control. Dr Shewhart's work was specifically aimed at the production process, but it became apparent that the theory of variation was equally applicable to all activities and it subsequently emerged as the cornerstone for the evolution of a total management philosophy relating to Quality control and improvement.

The evolution of this management philosophy of statistical quality control and its derivatives began in Japan in the early 1950s under the tutelage of the Americans, Dr W. Edward Deming and Dr Joseph Juran. Although it was introduced to Japan after the Second World War it is not specifically 'Japanese Management' since the principles on which the philosophy is based are universal. (Dr Deming attempted to introduce his ideas first to American industry, which was unreceptive at that time.) It is a different way of managing but many organisations in the Western world are still shadowed by traditional approaches to management that evolved during and since the Industrial Revolution.

Fredrick Winslow Taylor, founder of 'Scientific Management' may be blamed for the entrenchment of many practices and values current in our workplaces. This approach to management is often referred to as 'Taylorism'. The following quote from his work dramatises the underlying attitude:

> Under our system, a worker is told just what he is to do and how he is to do it. Any improvement he makes upon the orders given him is fatal to his success - *Frederick Winslow Taylor*. (Tribus 1988, p.4).

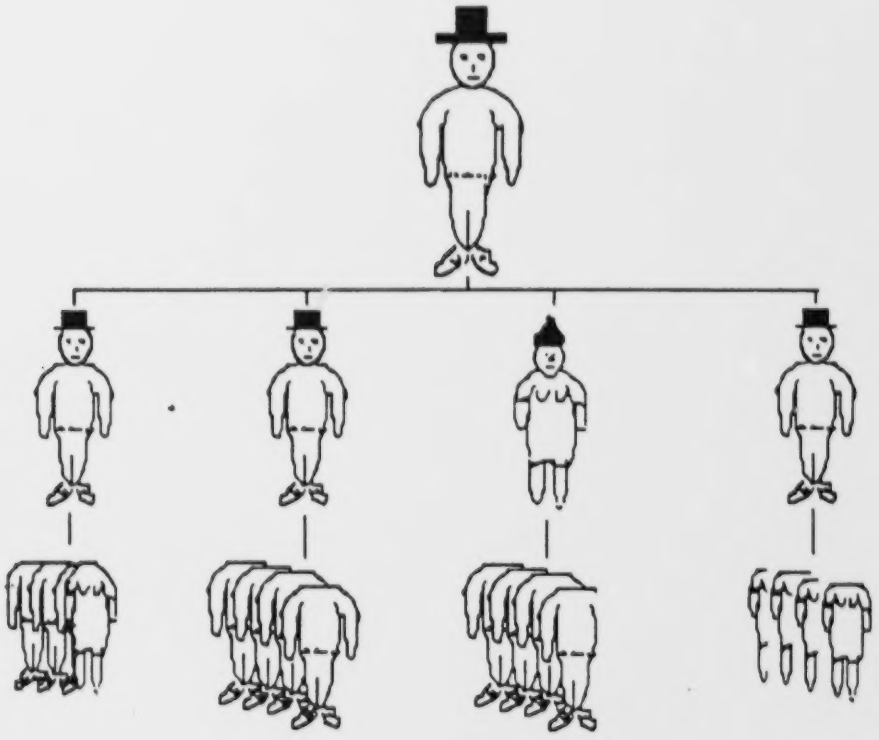
Key elements of 'Scientific Management' include a strictly hierachical work organisation and the 'deskilling of work by progressively narrowing the scope of each job. Though modified over a period of time, this management approach was successful for many years in achieving better productivity and efficiency but is increasingly ineffective in the new context of the 1980s, and 1990s.

Recognition of people and their value in the workforce is vital to quality improvement and competitiveness in Australian industry. The effective contribution of skills development and involvement in a strategy for quality and improvement requires changes in behaviours and attitudes.

In addition, the structures and systems within which we work need to provide an environment for communication, trust and involvement (Hayton & Harun 1988, p.21-5).

The traditional hierarchical organisation is displayed on an organization chart, such as the following one (Figure 2.1) from the Dutch organisation, MANS (Management, New Style). In the old style management, the people at operative level in the hierarchy had no heads. 'Park your brains by the door was the byword'. (Tribus 1988 p.17)

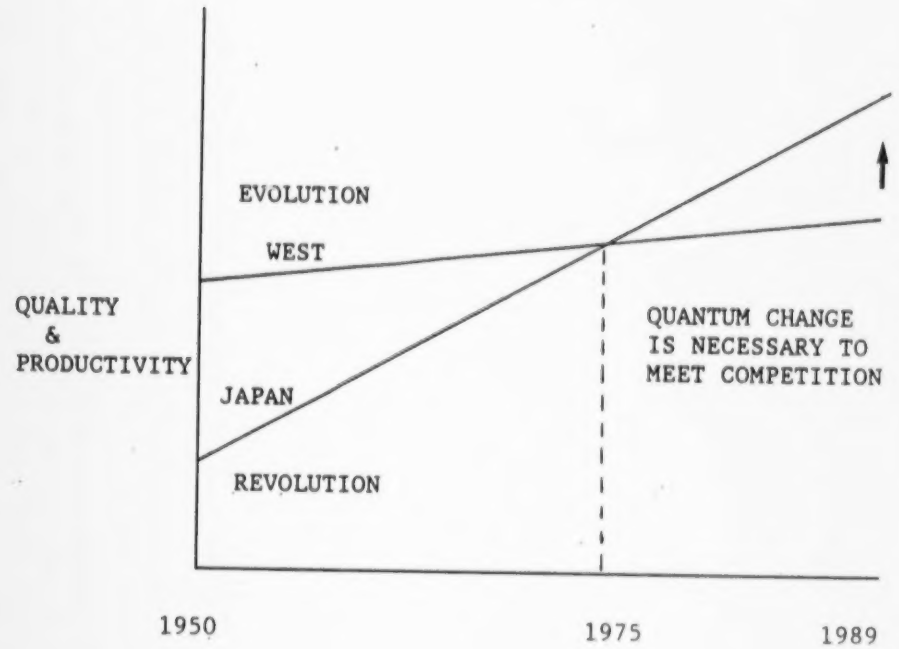
FIGURE 2.1 The hierarchy in a 'Taylorist' organisation



(Figure courtesy of MANS, Holland, and reproduced in Tribus 1988, p.17).

Quality and productivity improvements in the West have occurred primarily through improved technology and automation. Advancement has largely occurred through 'evolution'. In Japan, however, quality was not left to itself and was forced along a revolutionary path. The West and so-called developing countries are now rapidly adopting quality-based management, and significant improvements are being achieved. Figure 2.2 contrasts the relative position of Japan with its revolutionary approach to quality, and productivity improvement in the Western world. Unless a dramatic change occurs, Australian competitiveness in the international arena will be completely eroded.

FIGURE 2.2 **Comparison of Japan with the West on quality and productivity**



(from Tribus 1988)

The results challenge Australian industry and particularly TAFE, to undertake a review of these traditional approaches to management. The philosophies of Deming, Juran and others are widespread and Japan's achievement internationally is evidence of the success of a new way of managing for quality and improvement.

2.4 KEY PRINCIPLES

Eight key principles are discussed and these will be the basis for integrating quality into curricula.

The principles are universal and applicable to all industries. The training packages, curriculum models and resources are based on these concepts. It is suggested that the learning programmes lead students from the 'known to the unknown' so that they can transfer skills to industry in the future.

Curriculum developers and lecturers will need to develop specific industry case studies and examples for different TAFE courses. The Hospitality/Tourism industry survey results (Appendix C) indicates that there is a need to modify terminology in order to create learning packages which are meaningful for service industries.

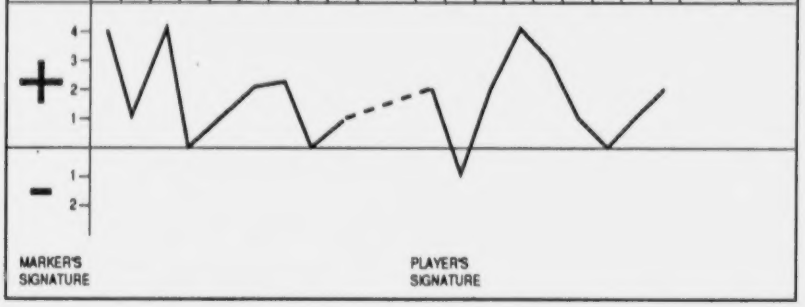
Principle 1: All systems exhibit variation

Stability, capability, control and improvement need to be understood.

This principle may be illustrated by a score-card in golf. An average golfer's score-card and graph of the variation are reproduced below:

Average golfer's score-card

HOLES	1	2	3	4	5	6	7	8	9	OUT	10	11	12	13	14	15	16	17	18	IN	Total
METRES	398	347	343	505	156	405	485	203	324	3164	394	349	149	455	342	512	406	170	362	3139	6303
PAR	4	4	4	5	3	4	5	3	4	36	4	4	3	5	4	5	4	3	4	36	72
SCORE	6	3	6	5	4	6	7	3	5	47	6	3	5	9	7	6	4	4	6	50	97



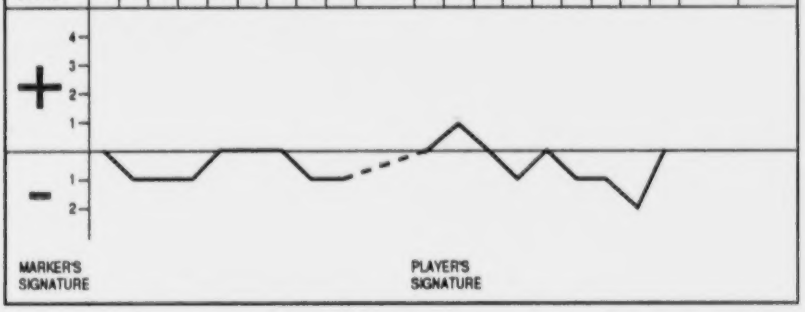
The two main features of the average golfer's score-card are high variation and an average score level well above the desired or 'target' score of par.

There are 'special' and 'common' causes of variation which need to be understood. If we can learn the causes of variation in processes we can react in order to control or improve the situation, e.g. use different club or get lessons from a professional!

A QUALITY GOLFER has improved performance based on a lower average score with less variation, as illustrated in the example below:

Professional Golfer's Score-card

HOLES	1	2	3	4	5	6	7	8	9	OUT	10	11	12	13	14	15	16	17	18	IN	Total
METRES	398	347	343	505	156	405	485	203	324	3164	394	349	149	455	342	512	406	170	362	3139	6303
PAR	4	4	4	5	3	4	5	3	4	36	4	4	3	5	4	5	4	3	4	36	72
SCORE	4	3	3	4	3	4	5	2	3	31	4	5	3	4	4	4	3	1	4	35	66



Thus, low variation and an average level close to the target are linked with high quality. We can apply this principle to all systems. The basic requirement is training in statistical quality control.

Examples for TAFE:

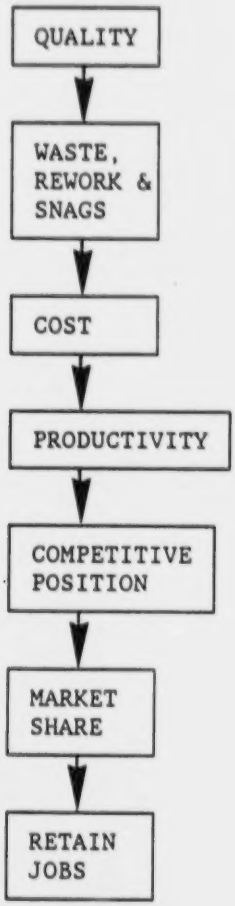
- Restaurant: variation in times required to service customers
- Printing: colour variation on the press
- Machining: variation in sizes of machined parts
- Manufacturing: product variation on production-line
- Tourism: fluctuations in airline schedules
- Management: profit variations.

The funnel experiment (Deming 1986, p.327) is a useful exercise to illustrate results of over-reaction or under-reaction to variations. By tampering with processes the quality can be adversely effected.

Principle 2: Quality does not cost, it pays

The reduction of variation and the systematic elimination of waste leads to higher quality, greater customer satisfaction and lower costs.

FIGURE 2.3: Flowchart of quality benefits



The deceptively simple flowchart (Figure 2.3) shown above demonstrates the benefits which accrue to companies with a total quality commitment. It shows that error-free products or services are the goal. There are numerous examples of companies in Australia with improved competitiveness as result of a total approach to quality. A survey in 1987 conducted by AOQC (Australian Organisation for Quality Control) of 200 new small to medium size manufacturing companies revealed:

> The single most important finding of the survey was the clear relationship between return on investment and measures of quality, including quality systems. (AOQC, 1987 p.2).

Of the firms surveyed, those with a quality system/program averaged a return on investment of 24% while those firms without a quality system/programs averaged 14%.

Principle 3: People work within systems

Managers must work on the system with the help of everyone in the system.

Managers are responsible for SYSTEMS. 85 percent of problems in a business can be attributed to the system. People within the system can help and should be involved in improvements and suggestions. 15 percent of problems can be attributed or controlled directly by individuals. If we accept this principle it follows that future managers for quality will need to understand how to:

- identify and describe systems;
- train employees how to observe systems;
- train employees in ways to improve systems;
- lead improvement teams;
- define directions for improvement;
- analyse systems;
- use statistical techniques (Tribus 1988, p.11).

This principle challenges and redefines the traditional manager's responsibilities.

Principle 4: Everyone serves a customer

Quality must focus on customer needs.

The importance of the customer cannot be over-emphasised in a strategy of quality and improvement. Everyone serves a customer. Questions to ask are:

. Who is your customer?

. What are your customer's requirements now?

. What are defined quality expectations?

. What are the future requirements of your customer?

. How can you meet these requirements?

The next person in line is your customer.
Quality is understanding and achieving customer satisfaction in the services or products we produce.

External customers ultimately judge whether quality is acceptable. Internal customers within organisations are equally important.

The principle is based on the premise that no organisation can survive unless its products and services are competitive in terms of quality, reliability, perceived value and delivery performance.

TAFE recognises people within the organisation as being the internal customers while students, industry and the community are external customers.

If customer requirements are not met the outcomes are likely to be:

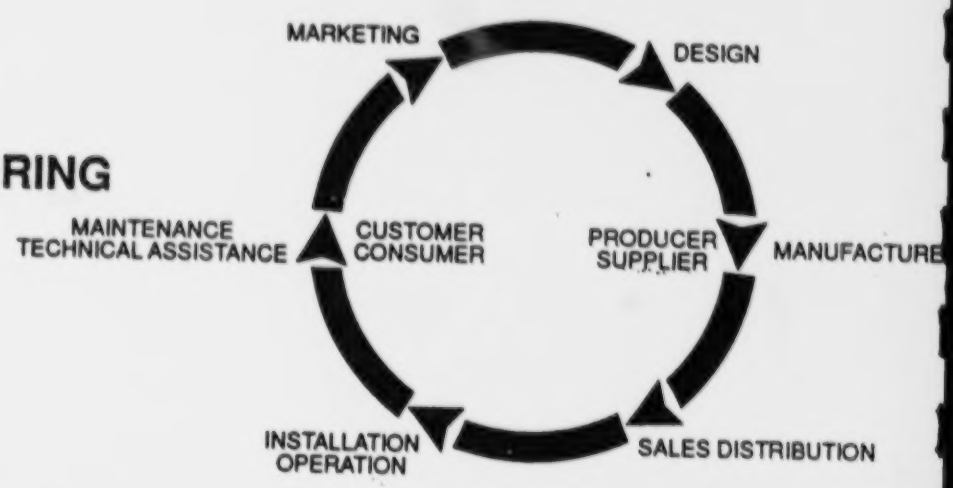
- poor quality;
- customer complaints;
- loss of market share;
- wasted time/effort/product/processes.

The benefits of being close to the customer are fundamental to quality improvement. The customer models (Figure 2.4) show that quality is a cyclical process of continuous improvement. The cycles show the main flows of products, services or information, but internal or external customers need to be considered at every stage of the cycle. We all need to recognise the next person in the cycle as our customer. Thus, these cycles may be considered as customer cycle models.

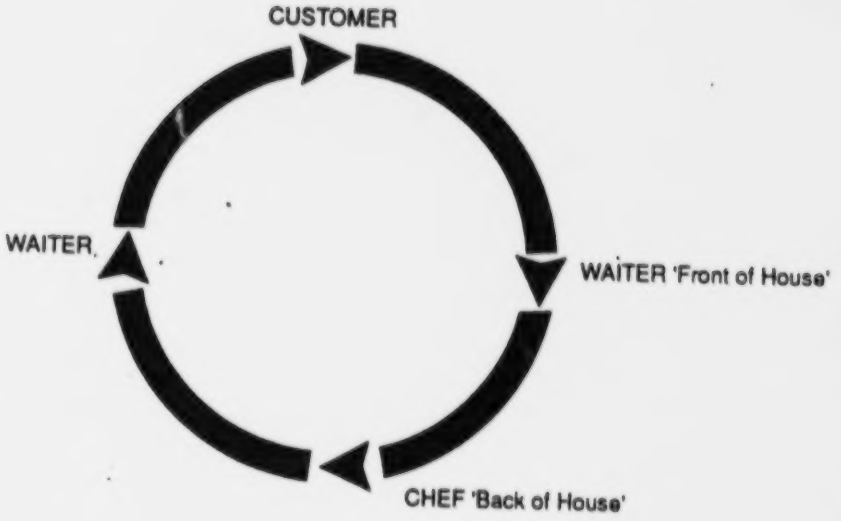
FIGURE 2.4 Three examples of customer cycle models

"THE NEXT PERSON IN THE CYCLE (OF FLOW OF PRODUCT, SERVICE OR INFORMATION) IS THE CUSTOMER"

MANUFACTURING



HOSPITALITY: RESTAURANT



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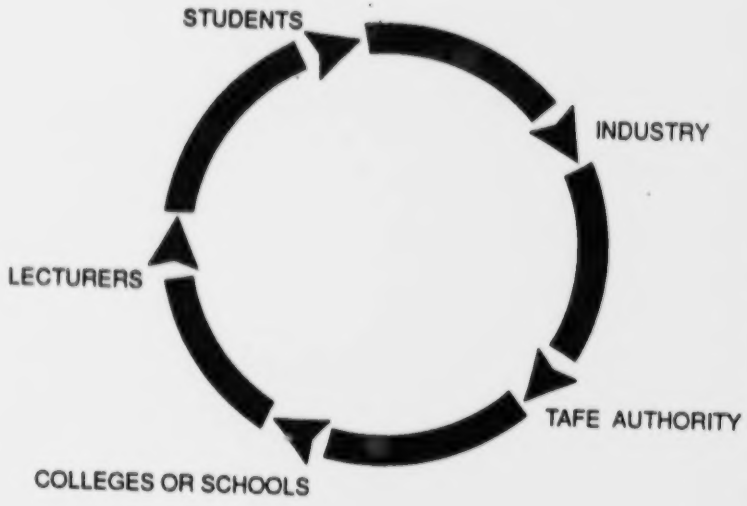


Notes: 1.These continuous cycles are derived from E. W. Deming (1986)
2. Curriculum developers could be shown as a separate stage in the cycle before or after colleges/schools, depending on the TAFE system

Principle 5: Improvement efforts should be plan-driven, not event-driven.

Efforts must be directed towards achievement of goals of quality.

The 'fire-fighting' approach to managing seldom achieves any long-term goals. The cost of poor quality and survival in business should serve as the catalyst for strategic quality planning. A commitment to quality requires planning at all levels in the organisation. Similarly, the curriculum development for this concept needs to be plan-driven and taken in stages to ensure effective integration into all TAFE courses. In this project the response from TAFE colleges has been favourable to the point of wanting to implement quality immediately. However, careful planning directed towards the achievement of realistic goals is required. Industry experiences indicate that significant achievements may take 2 to 6 years.

Principle 6: Improvement should be a way of life

Everyone should strive for continuous improvement by constantly seeking better techniques.

This principle is one of on-going, never-ending improvement. The Japanese use the word *KAIZEN* and it describes the process of breaking through to unprecedented levels of performance. It involves all of the workforce in problem-solving and improvement activities. It is logical therefore that such concepts as teamwork, problem-solving groups, specific projects, analyses, solutions and action plans for improvement should be included in curriculum on quality, and this should be included in all major vocational courses. The Juran Trilogy is the model on which curriculum components have been developed. It is a logical approach to:

- quality planning;
- quality control; and
- quality improvement.

Breakthroughs are necessary to attain improvements. The emphasis of traditional quality management focuses on quality control and assurance but fails to address improvement strategies.

Recent developments in quality of design concentrate efforts to improve product development and design. Strategies such as VAM (Value-Added Manufacturing) pursue the elimination of all non-value added waste. JIT (Just-in-Time) is a production strategy for continuous improvement based also on the elimination of waste and a high respect for people. The concept that the pursuit of quality and excellence is a journey (Robson 1988) reinforces the fact that it is not a 'quick-fix' package. Curriculum development in quality must also be constantly moving towards full integration into all courses and should be a continuing process.

Principle 7: Management by facts and data

Data are essential for solving problems and improving quality.

The basis for all decision-making is the collection of facts and data. The term management does not imply that this task is solely the manager's responsibility. Techniques for collecting data can take many forms such as questionnaires, surveys, checksheets and flowcharts, run charts, control charts, histograms. If the process cannot be measured then it cannot be controlled. Examples of data collection are customer surveys, records of waste, downtime on machines, sampling techniques for products, absenteeism records, accident records, records for defects, delivery performance and customer complaints.

Principle 8: Control the process, not the output

Permanent improvements can be made by standardising, controlling and then improving processes and procedures.

Traditional quality control looks at inspection of outputs as the way to eliminate defects. When providing a service in a hotel, bank or restaurant, management and staff react to customer complaints and sort out the problem after the event. One way of improving quality is to analyse the process of customer service or methods, materials, machinery or manpower (commonly refered to as 4 Ms.). Standardisation of methods and procedures becomes the cornerstone to making permanent improvements. Problem prevention efforts are directed towards controlling processes to prevent problems. Some important techniques can be used:

- identify processes - flowcharts;
- analyse processes - cause and effect diagrams;
- control processes - run charts, control charts;
- improve processes - involvement of people.

This principle can be applied to the process or the product.

PROCESS	PRODUCT
DESIGN	SPECIFICATIONS
PRODUCTION	GOODS
SALES	CUSTOMERS
MAINTENANCE	SERVICE
PRODUCT PLANNING	STRATEGIES
MANAGEMENT	GUIDANCE

TO IMPROVE THE PRODUCT
IMPROVE THE PROCESS

(Tribus 1988, p.19)

2.5 DIRECTIONAL CHANGES

In the industry survey for this project, the philosophy associated with the notion of quality was presented to industry in the form of a continuum of quality management practices (see Figure 3.1 in Chapter 3).

The profile expected in two years shows considerable changes in emphasis in industry practices.

The curriculum within TAFE needs to support these directional changes. The syllabus should be designed so that students are able to:

- understand and communicate 'quality' goals and objectives;
- determine key indicators of business performance;
- demonstrate improvement strategies by example;
- recognise 'internal' and 'external' customer needs;

- update standards for continuous improvement;
- standardise procedures and processes for improvement;
- involve everyone in improvement projects;
- recognise 'waste' in all forms;
- understand the changing role of supervisor/manager or coach and facilitator of team performance;
- systematically eliminate cross-functional barriers through co-operation and trust;
- recognise the abilities and potential of people;
- develop and encourage staff training.

The inclusion of the above into the curriculum will affect all TAFE vocational courses. However, the TAFE courses particularly affected by these directional changes will be in the management and supervisory fields.

2.6 BENEFITS OF INTEGRATING QUALITY INTO TAFE COURSES

Quality is everyone's responsibility, and certainly it should not be left to management or a specialist in a quality department. Similarly within TAFE, 'Quality' courses should not be isolated or unrelated to other courses.

Quality principles, concepts and techniques should be recognised and applied in all courses. This integrated strategy will:

- ensure present and expected future industry training needs are met (see the results of the industry survey in Chapter 3);
- facilitate the cultural and attitudinal changes necessary for quality and improvement;
- reinforce the concept of continuous improvement;
- show that standardisation, control and improvements can be made to processes, products and services;
- give students knowledge and techniques to help bring about change in their organisations;
- create and encourage the involvement of staff and students in a learning environment;

- develop awareness of importance of quality and customer requirements for students and TAFE staff;

- improve the long-term prospects of competitiveness, profitability and workforce well-being;

- create an understanding and sense of unity and purpose for TAFE, industry and students.

2.7 REQUIREMENTS FOR SUCCESSFUL INTEGRATION

Industry attempts to introduce quality circles and other employee involvement activities have floundered in those companies which lack a total approach to quality management. The successes of such employee involvement programmes depends greatly on management commitment and support. It is naive to expect that the TAFE experience will be any different unless, in the long-term, the TAFE authorities support the eight key principles as previously described. An excerpt from an article entitled 'Quality Circles: Application in vocational education' provides an insight into experience with quality in USA:

> Vocational education has a unique opportunity to facilitate the change to a TQC orientation. How can vocational education meet this challenge? The notions of total quality control and people building must be introduced into both the administrative systems and classrooms of vocational education institutions. The implication, of course, is that staff and instructors must themselves exemplify the value system implicit in these concepts. Students learn primarily in three ways: (1) cognitively (e.g. texts and lectures): (2) experientially (e.g. practice): and (3) through observation (e.g. role models). This means that the faculty and staff of vocational education institutions must outwardly express their inner commitment to the precepts of TQC and people building. (National Centre for Research in Vocational Education, Ohio State University 1983, p.23).

Integrating integrate quality into the curriculum effectively will rely heavily on TAFE management to support the allocation of resources, time, education and training to the curriculum developers, lecturers and other staff.

In summary, the major requirements for successful integration are the following:

- support of the TAFE authorities for the integration of quality concepts into TAFE courses;
- understanding of key principles and concepts of quality management by TAFE administrators, curriculum developers and senior lecturers;
- recognition of directional changes required in industry;
- recognition of potential barriers to integration;
- implementation of changes to be based on step-by-step achievements rather than on substantial changes in a short period of time;
- successful pilot courses to involve all relevant people in ownership and development of curricula;
- TAFE staff development in quality management.

3. INDUSTRY SURVEY

3.1 INTRODUCTION

Before developing curricula on quality, the TAFE National Centre conducted an industry survey to determine industry needs for quality training.

The purpose of the survey was to identify the actual requirements of industry and then to develop appropriate curricula for integrating quality training into existing TAFE courses.

Interviews were conducted in 40 firms in the following industries and states:

Manufacturing	-	New South Wales, Victoria and South Australia.
Tourism/hospitality	-	New South Wales, Victoria, South Australia and Queensland.

To conserve project resources, the survey was limited to these four states but we are confident that the main findings apply nationally.

The people interviewed were all most co-operative and helpful and appeared, without exception, to support the intent of the survey. Firms with a quality reputation and, wherever possible, persons with expertise in quality were targeted for interview. All interviews were conducted personally.

Interview forms were designed to gather data in four parts:

PART A: BACKGROUND INFORMATION
PART B: QUALITY STRATEGY
PART C: CURRENT AND EXPECTED QUALITY PROFILE
PART D: QUALITY TRAINING NEEDS

A summary of the results of the survey follows:

3.2 PART A: BACKGROUND INFORMATION

Part A was designed to identify the company, the location, type of industry, number of employees and a contact quality person in each organisation.

Companies interviewed were assured of confidentiality. The number of employees ranged from less than ten to more than 3000. The contact person was, wherever possible, a key quality practitioner.

3.3 PART B: QUALITY STRATEGY

Part B of the survey was designed to determine the following information:

- the company(s) goals;
- who, within the company, is involved in quality improvement;
- the company(s) quality strategy;
- in what way the strategy was developed and organised;
- how long the strategy has been in practice;
- why the decision to embark on a quality strategy was taken;
- the company(s) internal and external customers.

The Company(s) Goals

Survival, profit, competitiveness, customer service and the desire to be the best in the particular industry were the predominant responses in describing the company goals. The general consensus was that, in most companies, goals were known by all personnel.

Who, within the company, is involved in quality improvements

Everyone! was the overwhelming response. Typical comments were, 'Quality is a part of the (Company's) culture', 'Quality is a line management responsibility' and a large New South Wales firm even has quality as a permanent agenda item for senior management meetings.

The company(s) quality strategy

Consultants, Australian standards, total quality control, Deming's fourteen steps, quality circles and total quality management formed the basis of quality strategies for the companies surveyed.

The tourism/hospitality industry, as a general rule, does not appear to have well-defined quality strategies. However, it does appreciate that quality improvement is important to the well-being of the industry.

The way in which the strategy was developed and organised

The following is a representative list of how quality strategies were developed by the manufacturers interviewed:

- working to conform to Australian Standards 1821-23;
- establishing an inspection system of quality assurance;
- establishing quality circles;
- initiating total quality control;
- using consultants' advice;
- establishing statistical quality control;
- using just-in-time management strategy;
- setting objectives with periodic reviews;
- maintaining on-the-job training.

How long the strategy has been in practice

The period of implementation of formal quality strategies ranged from 1981 to 1988. However, 33 per cent of companies inaugurated strategies in 1986, 15 per cent in 1987 and 10 per cent in both 1983 and 1988. Furthermore, 88 per cent have introduced their quality strategy since 1983.

Why the decision was taken to embark on a quality strategy

Survival appears to be the uppermost response. One company stated that, 'Either we deliver the goods defect-free or the customer will find someone who can'.

Other responses included the need to overcome traditional attitudes, particularly to quality inspection versus production. Customer demands also figured high in the responses.

The company(s) internal and external customers

Of particular interest in this section were the responses to the customers within the company. It is obvious that the external customers are the actual purchasers of the product. Less obvious is the fact recognised by many of the companies that everybody within an organisation is a customer of everybody else.

One company claimed that the customer, '... is the owner of each function and the owner is the function in the chain of functions'.

3.4 PART C: CURRENT AND EXPECTED QUALITY PROFILES

Companies were requested to complete a chart depicting the current quality profile and the expectations in two years hence.

The average results are depicted in the Figures 3.1, 3.2, 3.3 and 3.4.

3.5 PART D: QUALITY TRAINING NEEDS

Training packages of various types are planned by all of the companies surveyed. 22 per cent of companies will involve senior management in quality training, 23 per cent section managers, 22 per cent process workers while 33 per cent indicated that all employees will be required to undertake formal quality training.

TAFE involvement in quality training appears to be required. 23 per cent of responses indicated a preference for a separate TAFE quality course. 37 per cent asked for quality to be integrated into all TAFE vocational courses. 19 per cent would consider in-house quality training using TAFE lecturers, with the proviso that TAFE lecturers be skilled quality practitioners (see page 46). 8 per cent opted for tertiary institutions to be the providers of quality training while 11 per cent preferred quality organisations to provide the training. There were 2 per cent of companies which conducted their own quality training and did not require the services of other providers. One organisation stated that it considered itself to be a provider of quality training to and for other firms.

The automotive industry, particularly in South Australia, advocated the Automotive Quality Assurance Process (AQAP) approach for quality training.

FIGURE 3.1 Comparison of the average quality practices, current and two years hence, as perceived by the manufacturing industries surveyed.

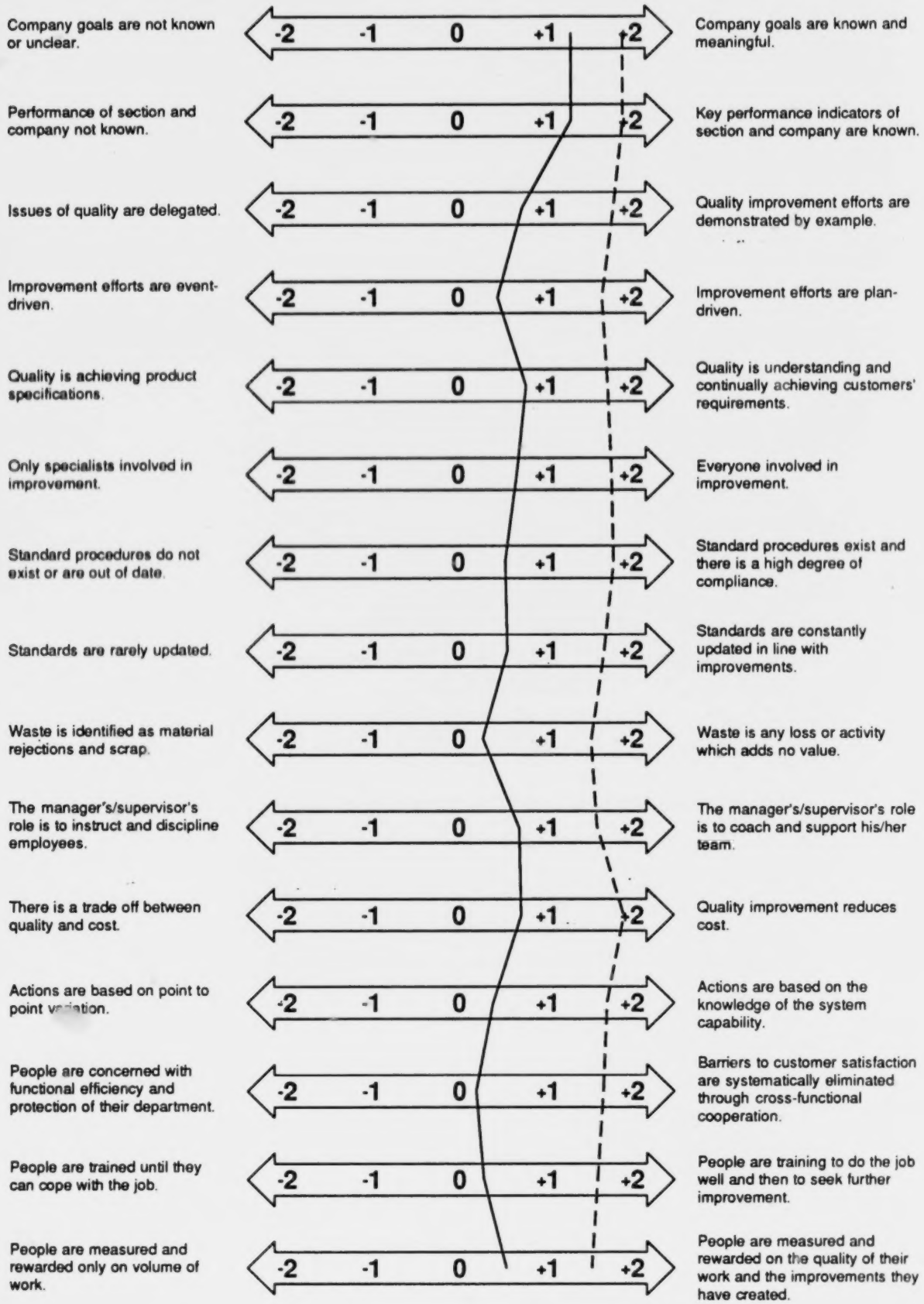

Company goals are not known or unclear.
-2 -1 0 +1 +2
Company goals are known and meaningful.
Performance of section and company not known.
-2 -1 0 +1 +2
Key performance indicators of section and company are known.
Issues of quality are delegated.
-2 -1 0 +1 +2
Quality improvement efforts are demonstrated by example.
Improvement efforts are event-driven.
-2 -1 0 +1 +2
Improvement efforts are plan-driven.
Quality is achieving product specifications.
-2 -1 0 +1 +2
Quality is understanding and continually achieving customers' requirements.
Only specialists involved in improvement.
-2 -1 0 +1 +2
Everyone involved in improvement.
Standard procedures do not exist or are out of date.
-2 -1 0 +1 +2
Standard procedures exist and there is a high degree of compliance.
Standards are rarely updated.
-2 -1 0 +1 +2
Standards are constantly updated in line with improvements.
Waste is identified as material rejections and scrap.
-2 -1 0 +1 +2
Waste is any loss or activity which adds no value.
The manager's/supervisor's role is to instruct and discipline employees.
-2 -1 0 +1 +2
The manager's/supervisor's role is to coach and support his/her team.
There is a trade off between quality and cost.
-2 -1 0 +1 +2
Quality improvement reduces cost.
Actions are based on point to point variation.
-2 -1 0 +1 +2
Actions are based on the knowledge of the system capability.
People are concerned with functional efficiency and protection of their department.
-2 -1 0 +1 +2
Barriers to customer satisfaction are systematically eliminated through cross-functional cooperation.
People are trained until they can cope with the job.
-2 -1 0 +1 +2
People are training to do the job well and then to seek further improvement.
People are measured and rewarded only on volume of work.
-2 -1 0 +1 +2
People are measured and rewarded on the quality of their work and the improvements they have created.
CURRENT
TWO YEARS

FIGURE 3.2 Comparison of the average quality practices, current and two years hence, as perceived by the tourism/hospitality industries surveyed.

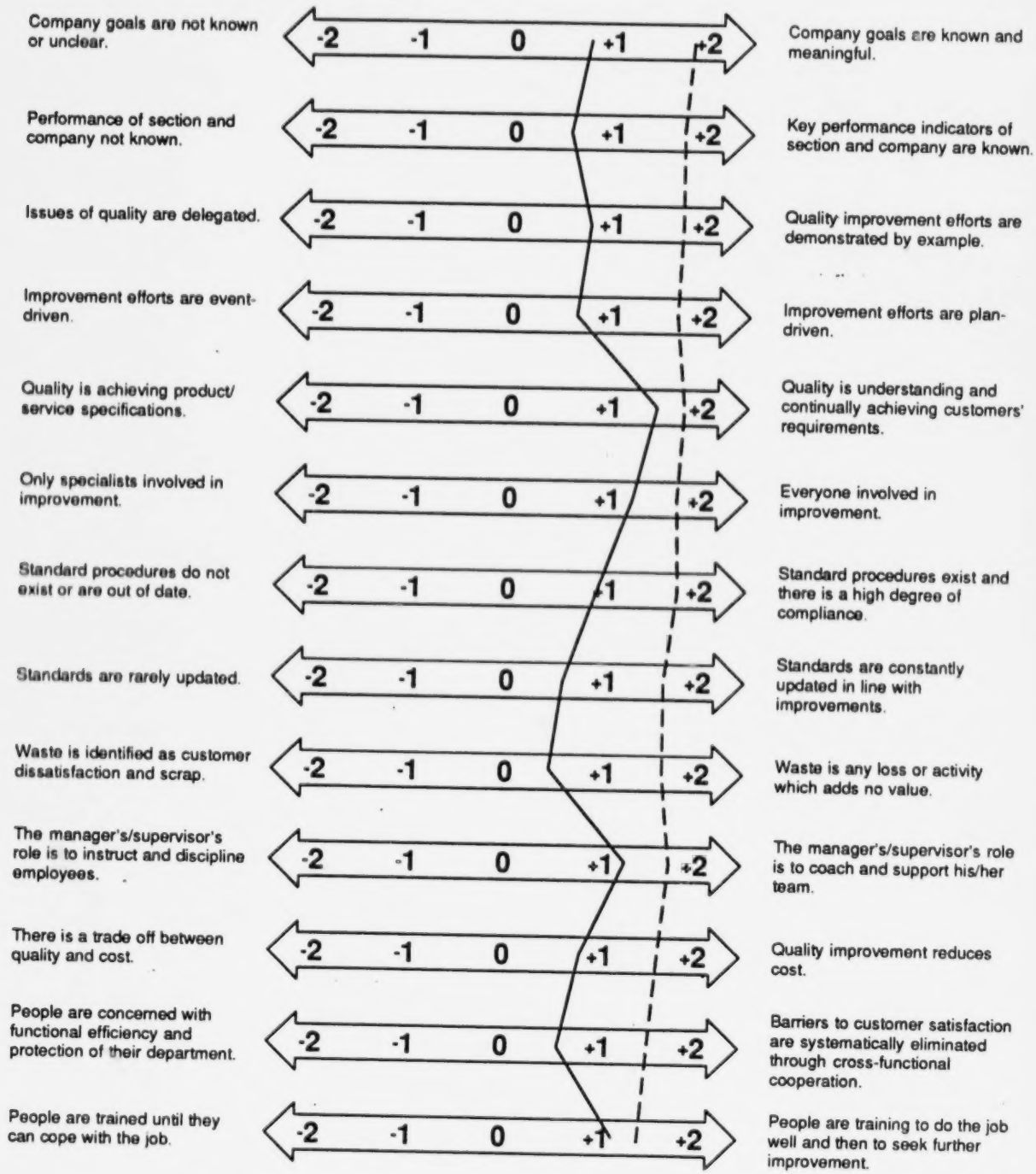
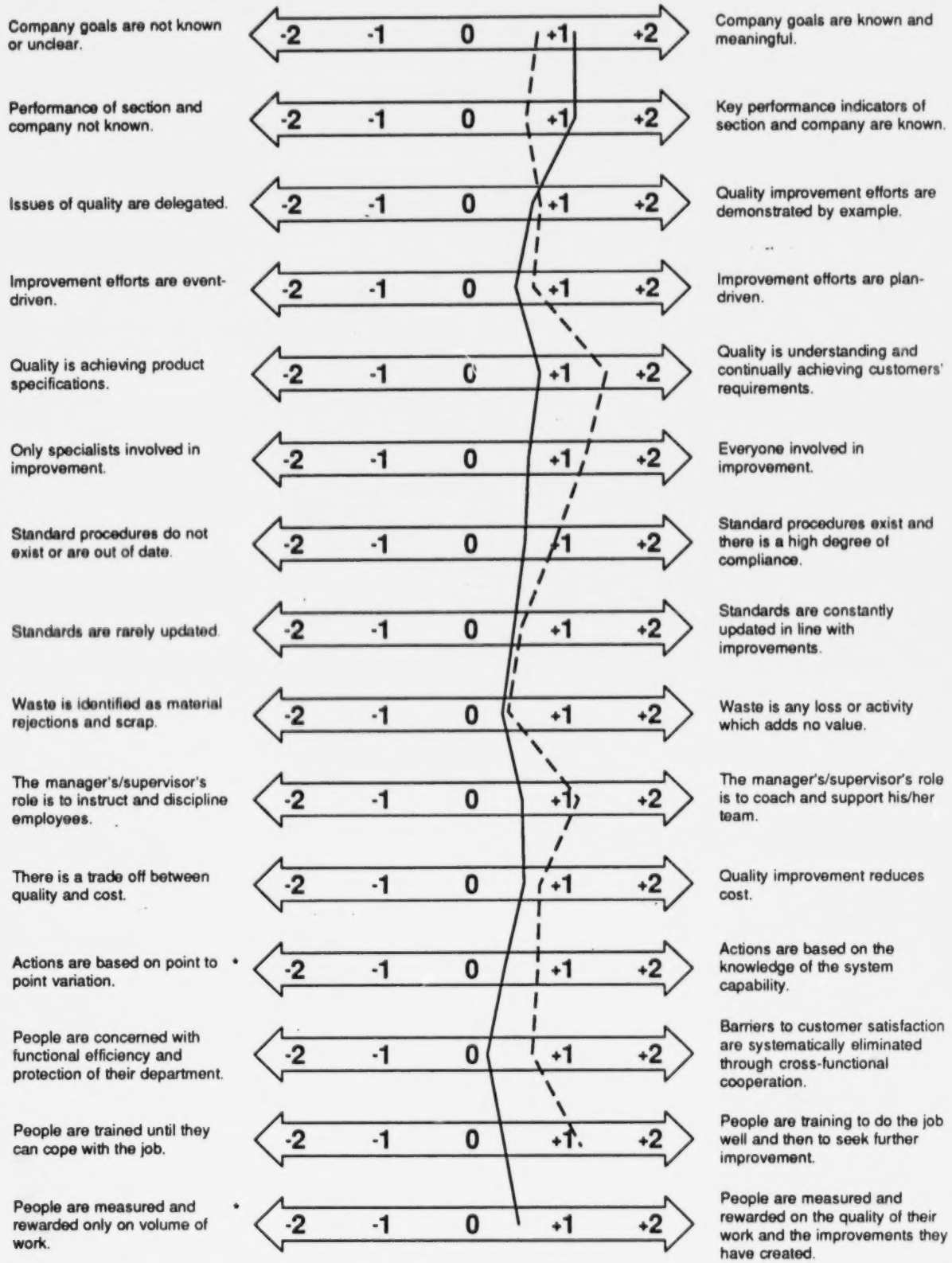

Company goals are not known or unclear.
Company goals are known and meaningful.
Performance of section and company not known.
Key performance indicators of section and company are known.
Issues of quality are delegated.
Quality improvement efforts are demonstrated by example.
Improvement efforts are event-driven.
Improvement efforts are plan-driven.
Quality is achieving product/ service specifications.
Quality is understanding and continually achieving customers' requirements.
Only specialists involved in improvement.
Everyone involved in improvement.
Standard procedures do not exist or are out of date.
Standard procedures exist and there is a high degree of compliance.
Standards are rarely updated.
Standards are constantly updated in line with improvements.
Waste is identified as customer dissatisfaction and scrap.
Waste is any loss or activity which adds no value.
The manager's/supervisor's role is to instruct and discipline employees.
The manager's/supervisor's role is to coach and support his/her team.
There is a trade off between quality and cost.
Quality improvement reduces cost.
People are concerned with functional efficiency and protection of their department.
Barriers to customer satisfaction are systematically eliminated through cross-functional cooperation.
People are trained until they can cope with the job.
People are training to do the job well and then to seek further improvement.
-2 -1 0 +1 +2
CURRENT
TWO YEARS

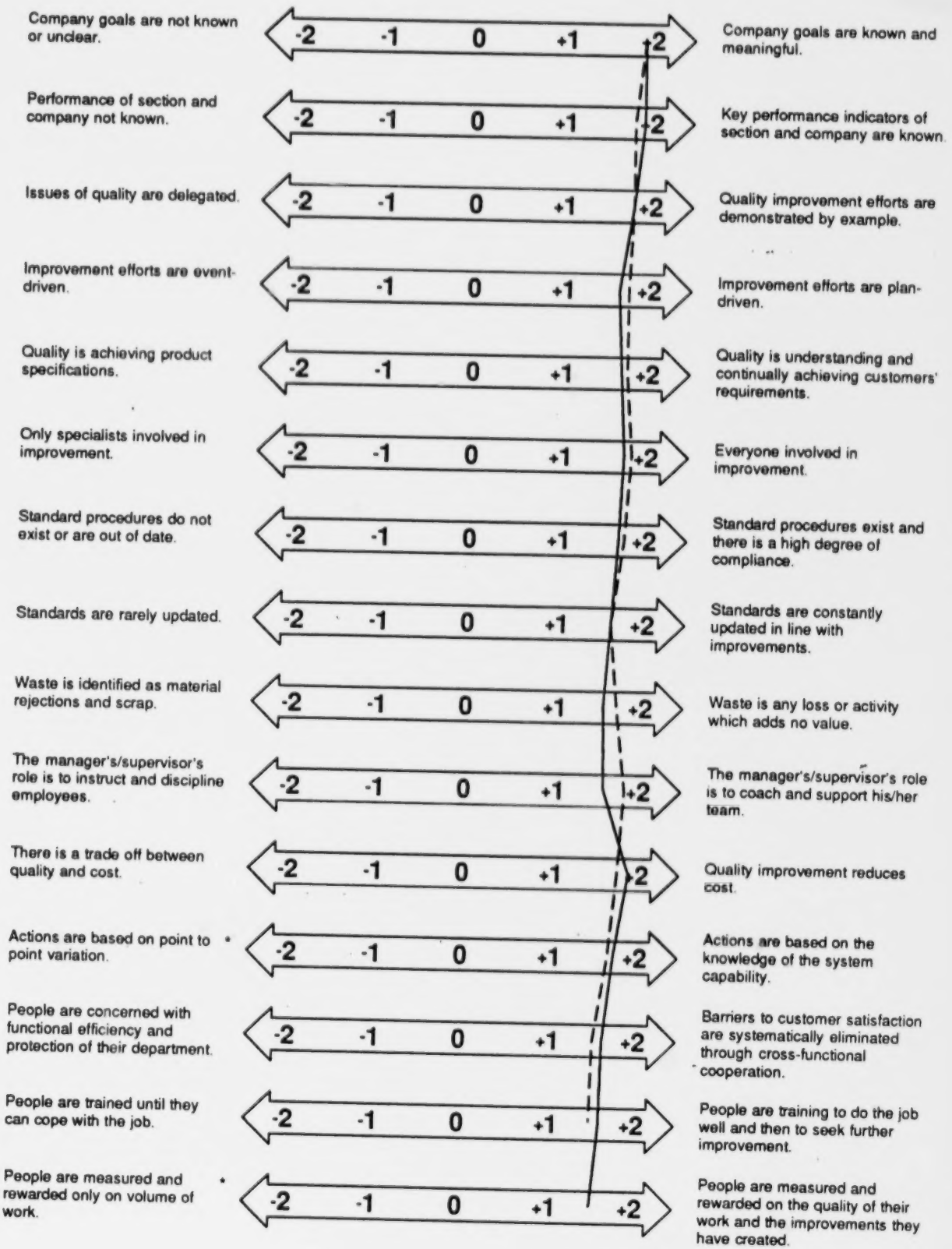
FIGURE 3.3 Comparison of the average current quality practices between the manufacturing and tourism/ hospitality industries surveyed.


Company goals are not known or unclear.
Company goals are known and meaningful.
Performance of section and company not known.
Key performance indicators of section and company are known.
Issues of quality are delegated.
Quality improvement efforts are demonstrated by example.
Improvement efforts are event-driven.
Improvement efforts are plan-driven.
Quality is achieving product specifications.
Quality is understanding and continually achieving customers' requirements.
Only specialists involved in improvement.
Everyone involved in improvement.
Standard procedures do not exist or are out of date.
Standard procedures exist and there is a high degree of compliance.
Standards are rarely updated.
Standards are constantly updated in line with improvements.
Waste is identified as material rejections and scrap.
Waste is any loss or activity which adds no value.
The manager's/supervisor's role is to instruct and discipline employees.
The manager's/supervisor's role is to coach and support his/her team.
There is a trade off between quality and cost.
Quality improvement reduces cost.
Actions are based on point to point variation.
Actions are based on the knowledge of the system capability.
People are concerned with functional efficiency and protection of their department.
Barriers to customer satisfaction are systematically eliminated through cross-functional cooperation.
People are trained until they can cope with the job.
People are training to do the job well and then to seek further improvement.
People are measured and rewarded only on volume of work.
People are measured and rewarded on the quality of their work and the improvements they have created.
-2 -1 0 +1 +2

MANUFACTURING:_____ TOURISM/HOSPITALITY:.....

**Deleted from Tourism/Hospitality Profile.*

FIGURE 3.4 Comparison of the average expected quality practices (two years hence) between the manufacturing and tourism/hospitality industries surveyed.


Company goals are not known or unclear.
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-2 -1 0 +1 +2
People are measured and rewarded on the quality of their work and the improvements they have created.

MANUFACTURING:_____ TOURISM/HOSPITALITY:.....

**Deleted from Tourism/Hospitality Profile.*

36

The question of attitudinal change appeared to dominate the thinking of quality managers and this can be summed up by the observation made by one large South Australian company:

> The approach to quality training needs to start with attitudinal change and understanding of basic principles of systems, variation, control and improvement.

3.6 THE LEVEL OF IMPORTANCE OF SKILLS IN QUALITY TRAINING AS PERCEIVED BY INDUSTRY.

A matrix was used to determine industry's concept of the required skills and their importance in quality training. A grading of 2, 1, 0 was used; 2 for essential, 1 for desirable and 0 for unnecessary.

Because of possible different contexts of the manufacturing and the tourism/hospitality industry two separate matrices were developed. The main difference between the two was that in the tourism/hospitality matrix, some of the 'employee level' categories and quality acronyms were deleted.

Figure 3.5 depicts the percentage level of the importance of quality skills as perceived by the manufacturing industry. The tourism/hospitality response is shown in Figure 3.6 and a comparison of the two industries appears as Figure 3.7.

3.7 FURTHER COMMENTS

Respondents were then given the opportunity to make any other comments, either in relation to the survey, or any other aspect of quality needs and training.

One South Australian company felt that the Federal Government should be further involved in the matter of quality and urged that, 'The Federal Government must call a Quality Summit'.

The question of attitude was again raised in this section of the survey with one company stating, 'Barriers to improvement are [the] attitudes and traditional management practices which encourage inefficiency and poor quality'.

Although TAFE appeared to have the general support of industry one company complained that, in a quality course at a TAFE college,

> 'The students sensed that TAFE lecturers did not practice what they preached and did not regard students as customers'.

The statement implied that it was the attitude rather than the lack of knowledge of the lecturers involved in the course, that prompted the remark.

A company involved in the hospitality industry felt that secondary school graduates are lacking in '... the skills of geography, history, language and tolerance for other cultures'.

3.8 CONCLUSIONS FROM THE SURVEY

1. There is a need for TAFE curricula to include relevant quality topics, integrated at appropriate stages of the educational programme, in all vocational courses.

2. Staff development in quality is imperative for TAFE lecturing staff.

3. The curriculum development of quality programmes should be carried out with the assistance and guidance of persons with the expertise in modern quality philosophies and practices.

4. The essential components of modern philosophies and practices with respect to quality should include the participation of employers, employees and government working together to achieve quality improvement in the workplace.

5. There is a need for behavioural/attitudinal changes by employers and employees for the success of quality practices in the working environment.

6. The effectiveness of any quality training programme is dependent upon the manner of implementation into the workplace.

Figure 3.5 : **Percentage of the Level of Importance of Skills: Manufacturing.**

(■ = Essential; ▨ = Desirable; □ = Unnecessary)

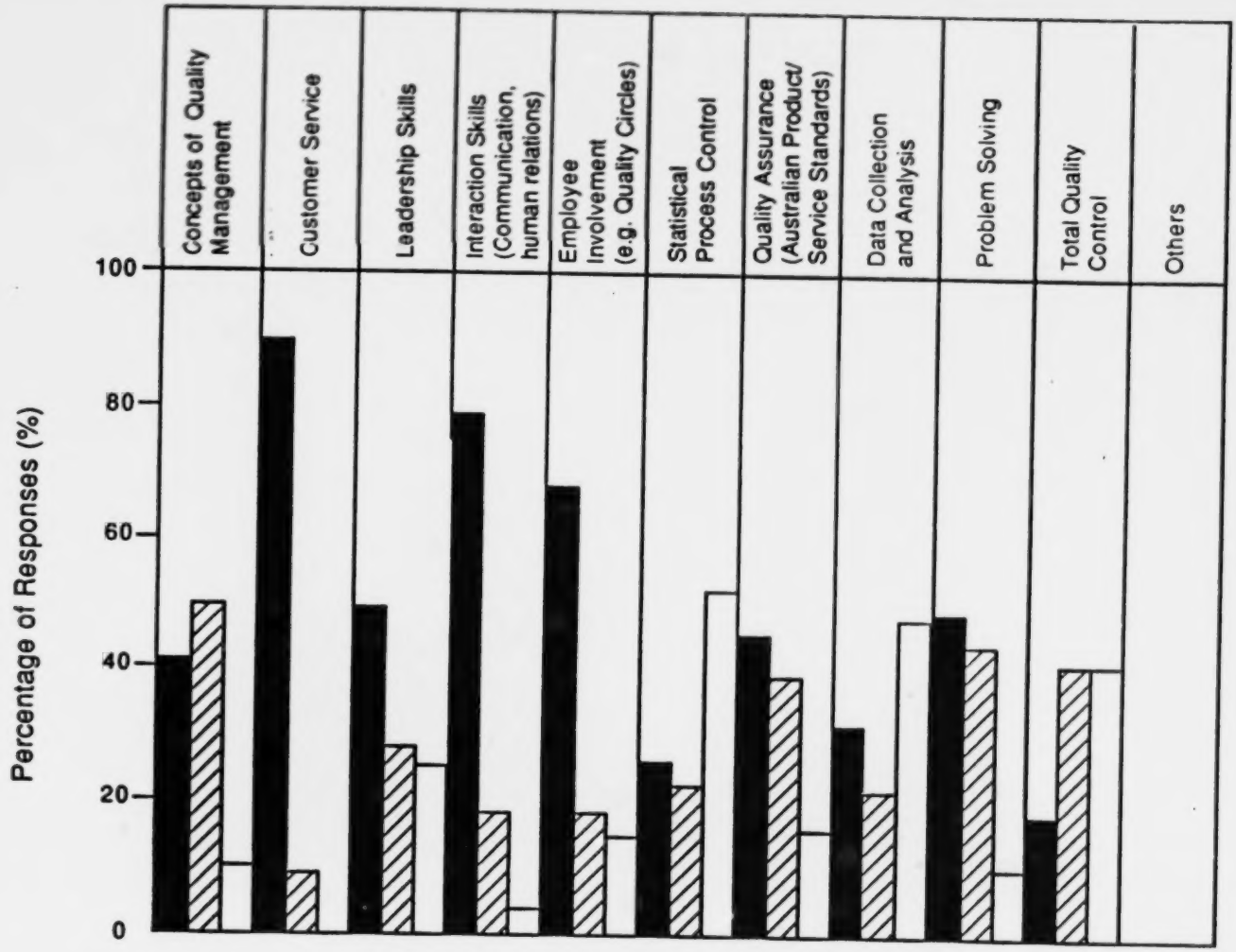


Figure 3.6 : **Percentage of the Levels of Importance of Skills: Tourism/Hospitality**

(■ = Essential; ▨ = Desirable; □ = Unnecessary)

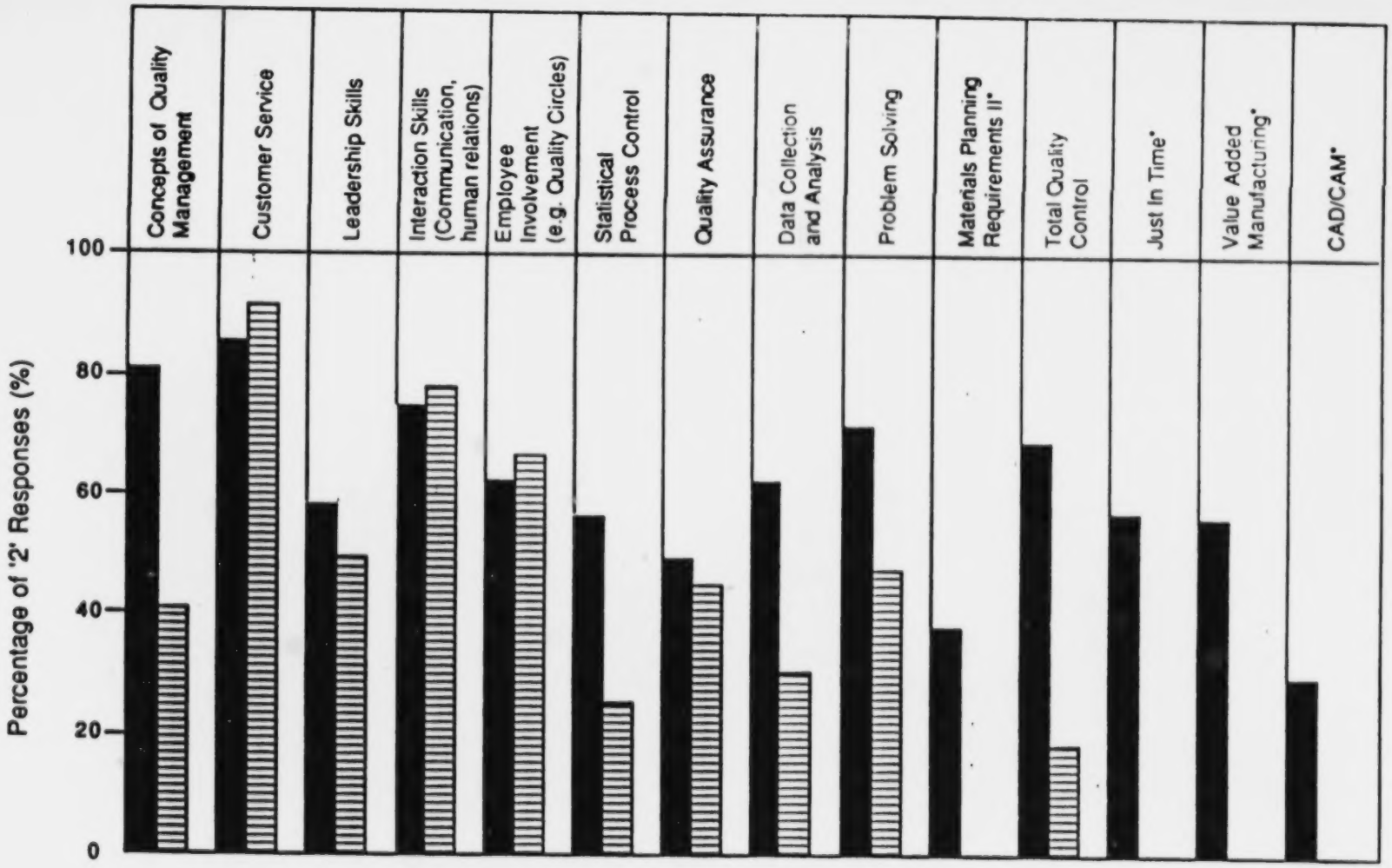


Figure 3.7 : **Comparison of Manufacturing with Tourism/Hospitality on percentage of responses regarding skill as 'essential'**

(■ = Manufacturing; ▤ = Tourism/Hospitality) *Skill topic not listed in Tourism/Hospitality Survey

4. POLICY SUGGESTIONS

The integration of quality into existing TAFE vocational courses has implications that will require general policies in the following:

A. Curriculum Development

B. Accreditation/Re-accreditation

C. Staff Development

The policy suggestions are outlined hereunder with relevant points of discussion.

A. CURRICULUM DEVELOPMENT : POLICY SUGGESTIONS

There are nine policy suggestions arising from the general policy:

A.	That TAFE curricula for all vocational courses include relevant quality topics, integrated at appropriate stages of the educational programme.

Policy Suggestion A1.

That vocational education programmes on quality conducted by TAFE authorities be consistent with the recommendations of the Foley Report. (1987)

COMMENTS

1. "It is important to emphasise that the raising of quality awareness and performance of Australian industry has major implications for the education system. Awareness and acceptance of the importance of quality would be of little value if managers and employees do not have the understanding, knowledge and skill to give effect to the means to raise quality." (Foley 1987, p.2)

2. TAFE authorities have a role in providing a national effort towards the development of appropriate curricula for a modern approach to the management of quality improvement.

3. Any development material should be made freely available to and between a national network of TAFE colleges.

4. Appropriate publicity material should be disseminated to industry organisations and bodies so that the workforce becomes fully aware of education policies with respect to quality.

Policy Suggestion A2.

That curriculum development procedures within TAFE reflect the training needs of industry with respect to quality matters.

COMMENTS

1. Curriculum development strategies in quality should reflect input from quality organisations, quality consultants, the Standards Association of Australia, and employer and employee bodies.

Policy Suggestion A3

That TAFE education programmes emphasise the application, in the working environment, of modern philosophies and principles of operation of quality.

COMMENTS

1. The scope and application of knowledge relating to quality topics is continually expanding.

2. The process of expansion of knowledge of quality affects the standard of education programming provided within TAFE as well as curriculum content and the expertise of lecturing staff.

3. The modern philosophy means that everybody in the working environment should be involved in quality improvement, with top management playing a key and exemplary role.

4. Education programmes relevant to particular vocations must provide up-to-date knowledge and skills relating to quality.

5. Knowledge of lecturing staff in relation to quality matters should reflect modern philosophies and practices used in industry.

Policy Suggestion A4.

That the curricula for each vocational course include relevant quality topics, integrated at appropriate stages throughout the education programme.

COMMENTS

1. The range of topics included in the philosophies and practices of quality is quite extensive.

2. The relevance of quality topics does not vary greatly between and within particular industries.

3. The curriculum for a specific quality topic, therefore, need not vary to any large degree for particular industries.

4. Quality topics should reflect issues which an employee is likely to encounter in his/her working life.

Policy Suggestion A5.

That all major TAFE vocational programmes provide students with an understanding of the key principles of quality management and improvement.

COMMENTS

1. There is a need for major TAFE vocational programmes to include information on quality improvement which is applicable to all vocations and which will provide students with the key principles of quality management and improvement (see Section 2.4).

2. Quality topics include, for example, the concepts of quality management, customer service, interaction skills, employee involvement, problem-solving and specific systems for achieving quality improvement.

3. It is suggested that, in this context, major TAFE vocational programmes be defined to include all initial vocational courses (stream 3000 courses) of duration one year or longer.

Policy Suggestion A6.

That TAFE vocational programmes include learning objectives related to quality improvement issues which are relevant to specific industries.

COMMENTS

1. TAFE programmes should be flexible and adaptable in order to meet the training needs of specific industries.

2. Wherever possible, quality topics should be integrated into existing courses.

Policy Suggestion A7.

That quality topics be included in vocational programmes with the aim of providing the knowledge, skills and attitudes which will enable the student to accept the principles of quality improvement throughout the student's working life.

COMMENTS

1. TAFE should promote the concept of a quality ethic to initiate long-term attitudinal changes.

2. 'Students need to be taught the benefits in terms of personal satisfaction and of the general welfare of the community of seeking to achieve quality in everything they do.' (Foley 1987, p. 39)

Policy Suggestion A8.

That TAFE staff be encouraged to develop innovative approaches to the teaching of quality topics in vocational programmes.

COMMENTS

1. There is a need to develop an innovative approach to the teaching of quality topics.

2. The help of those in industry with skills which demonstrate expertise in modern quality management should be enlisted to assist lecturers attain the skills in quality topics.

3. There is a wide range of resource materials available in the field of quality improvement/management (see Appendix C). The video training packages developed in this project have been designed for use in TAFE (see Chapter 7).

4. Quality topics may be perceived as subordinate to the mainstream of knowledge and skills for particular vocations. Lecturers may, therefore direct their efforts to the material with which they are familiar and not provide similar expertise to the teaching of quality topics.

5. TAFE colleges could appoint an advocate to promote quality training programmes. The term *champion* is used by Dr J. Juran and refers to a responsible person who will persevere and guide quality training through the inevitable obstacles and resistance to change. A champion should be a person who:

   - understands the principles of modern quality management and improvement;
   - is committed to the integration of quality into TAFE vocational programmes;
   - has good inter-personal skills and may therefore be an effective 'change agent'.

   Quality champions may, for example, be College Prinicpals/Directors. In the initial stages it may also be helpful to appoint a state-wide quality co-ordinator for the TAFE system in order to oversee the establishment of quality champions and quality programmes.

Policy Suggestion A9.

That curriculum development of quality programmes be carried out with the assistance and guidance of quality practitioners.

COMMENTS

1. *Quality practitioners* are defined here as persons who:

   - have a good knowledge and understanding of modern principles of quality management and improvement;
   - are committed to keep up-to-date with developments in quality practices in industry.

2. Quality improvement issues will ultimately affect every person in the workforce.

3. It is therefore important that the appropriate advice be obtained as it relates to quality matters when the curriculum development procedures are carried out.

4. It is suggested that quality practitioners should be members of all curriculum development committees.

Policy Suggestion A10.

That, in addition to the integration of quality into vocational programmes, short courses in quality management and improvement be developed and offered for use in re-training existing members of the workforce.

COMMENTS

1. Many people in the workforce have completed TAFE and other courses without training in modern quality management and improvement. As industry moves towards implementing modern quality practices, the need and demand for such training will increase over the next few years.

2. These courses should be designed for non-specialists in quality.

3. The provision of such short courses will not diminish the need for the integration of quality into major TAFE vocational programmes.

B. ACCREDITATION/RE-ACCREDITATION

There are four policy suggestions arising from the general policy:

B.	That all vocational education programmes submitted for accreditation/re-accreditation include relevant quality issues.

Policy Suggestion B1.

That all vocational education programmes submitted for accreditation or re-accreditation by TAFE authorities comply with TAFE policies with respect to the integration of quality topics into vocational courses.

COMMENTS

1. Quality topics should be integrated at appropriate stages into a vocational programme.

2. The stage at which quality topics should be integrated is dependent upon the structure of the curriculum for specific vocational courses.

3. The emphasis in course development should be on the integration of quality with other topics of a particular course, although for many courses it will be appropriate to have, in addition, separate quality subjects or modules.

4. It is suggested that the procedure used for integration should be explained in the accreditation/re-accreditation documents.

Policy Suggestion B2.

That all TAFE vocational education programmes include the application, in the working environment, of the principles and practices of quality.

COMMENTS

1. In recent years there has been an increasing awareness of knowledge in the field of quality improvement. The application of quality into the workplace however has been limited.

2. Vocational education programmes should reflect modern principles, practices and strategies in quality improvement.

3. Modern philosophies of quality practices could be written into accreditation and re-accreditation documents.

Policy Suggestion B3.

That all TAFE vocational education programmes submitted for accreditation or re-accreditation demonstrate that participation of all interested parties has occurred in the development of material relating to quality.

COMMENTS

1. The essential components of modern philosophies relating to quality matters include the participation of employers, employees and governments working together to achieve quality improvement in the workplace.

2. Specific consultations with employer and employee groups, quality practitioners and government representatives should occur and any issues arising should be incorporated into curriculum development.

3. A statement relating to the use of this process could be included in the accreditation/re-accreditation documents.

Policy Suggestion B4.

That the accreditation or re-accreditation process include consideration of the knowledge of quality which lecturing staff will require for vocational programmes.

COMMENTS

1. It is acknowledged that the knowledge associated with quality practices is continually growing.

2. This knowledge may not have been incorporated into modern teaching practices used by TAFE lecturing staff.

3. It will be necessary, in the curriculum development procedure, to give consideration to the acquisition of knowledge relating to quality by lecturing staff.

4. Where necessary, appropriate training should be made available for TAFE lecturing staff to update their knowledge of quality topics (see the next Section).

5. A statement describing the training needs of TAFE staff could be included in the accreditation/re-accreditation documents.

C. STAFF DEVELOPMENT

There are three policy suggestions arising from the general policy:

C.	That staff development programmes be provided in quality for all TAFE lecturers involved in vocational education.

Policy Suggestion C1.

That staff development in quality be provided for all TAFE lecturing staff involved in vocational courses.

COMMENTS

1. TAFE lecturing staff in the network of colleges throughout Australia provide a substantial group who can influence the awareness of quality improvement in the community.

2. Many of the lecturing staff in TAFE have kept up-to-date with current practices in their own particular vocational area and, in many cases, have initiated changes to curricula. However, it is apparent that the modern philosophies of quality may not have been obvious to many of these lecturers.

3. The need for training in the principles of quality requires that opportunities be made available to lecturers to enable them to keep up with quality training needs.

4. A nucleus of lecturing staff, with the expertise to teach quality in all colleges, should be made available at the earliest opportunity.

5. Staff development in quality along the lines suggested will require planning and the allocation of appropriate resources.

Policy Suggestion C2.

That co-ordinators of vocational education programmes provided by TAFE authorities, together with quality practitioners, regularly update the knowledge of quality practices of lecturing staff involved in the programmes.

COMMENTS

1. A programme could be developed by TAFE colleges to provide regular training in quality topics for lecturing staff.

2. It may be necessary to use the advice of quality practitioners (see page 46) who are familiar with modern industrial practices.

3. The responsibility for the co-ordination of the quality training for lecturing staff could be included in the duties of the designated quality champion (see page 45) within each college.

Policy Suggestion C3.

That, to ensure the success of current quality strategies, TAFE training and development programmes related to quality emphasise the need for atitudinal changes by employers and employees.

COMMENTS

1. "There is a need for major attitudinal change in relation to quality, both in the community generally and specifically in Australian industry." (Foley 1987, par. 3.80)

2. There has been a gradual awakening to the needs of quality improvement in Australian industry. TAFE should assist industry by providing training in quality in all vocational courses.

3. Graduates of TAFE courses involved with quality training will help break down the barriers to the acceptance of quality improvement strategies.

4. TAFE lecturing staff should be made aware, if not already so, of the need to overcome resistance to quality training.

5. CURRICULUM FRAMEWORK

5.1 INTRODUCTION

The purpose of the curriculum framework is to provide an approach to curriculum development. The curriculum framework to be described in this chapter will offer an approach to developing curricula on quality that integrates quality components into existing TAFE vocational courses: the framework should be applicable to all TAFE vocational courses, but will be illustrated for just three existing TAFE courses.

The curriculum framework provides the basis for curriculum development, but should itself be based on industry's training needs. This is illustrated in the model given in Figure 5.1. The model indicates a linear progression from:

- identifying industry's training needs;
- constructing a curriculum framework;
- developing curriculum;
- implementing; to
- evaluating.

5.2 THE CURRICULUM FRAMEWORK

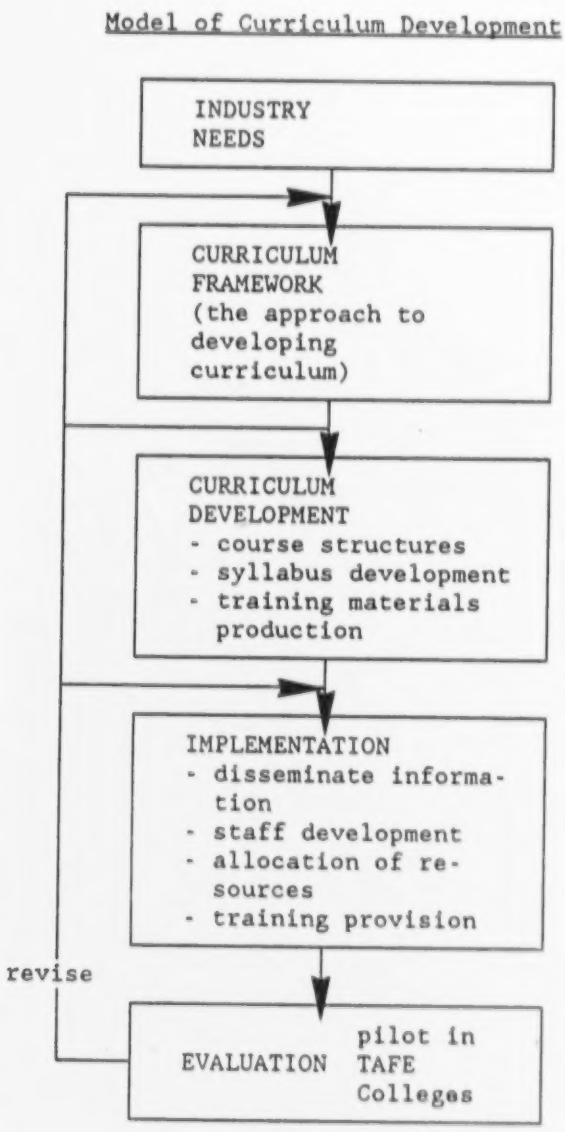
Knowledge, skills and attitudes related to quality may be divided into three broad categories:

- skills (including knowledge and attitudes) that are prerequisites to quality skills;
- general quality principles;
- industry-specific quality principles.

Examples of skills prerequisite to quality skills include:

- communication;

FIGURE 5.1: Curriculum development model for the TAFE quality project



*Note: *The above project activities relate to three areas of TAFE curriculum (as a pilot) within manufacturing and tourism/hospitality.*

- human relations;
- group dynamics.

Examples of skills relevant to general quality principles include:

- data collection and analysis;
- 7 tools of TQC - problem-solving;
- statistical process control.

Examples of skills relevant to industry-specific quality principles include:

- metrology - fitting, machining and tooling;
- reliability in design - engineering;
- MRP II (Manufacturing Resources Planning) - manufacturing.

These skills may be designed as learning objectives in TAFE courses in one or more of the following four course structure arrangements:

- quality skills constitute whole courses;
- quality skills constitute subjects or modules within courses;
- quality skills constitute competencies or single lessons within courses;
- quality skills are fully integrated with other skills within courses.

All the major approaches to quality curriculum development may be represented by one or more cells in the matrix of quality skill categories cross-tabulated by course structure arrangements, as shown in Figure 5.2.

FIGURE 5.2: Matrix of curriculum development approaches based on quality skill category and course structure arrangement

		QUALITY SKILL CATEGORY		
		SKILLS PREREQUISITE	GENERAL QUALITY PRINCIPLES	INDUSTRY SPECIFIC QUALITY PRINCIPLES
COURSE STRUCT. URE	Whole courses in quality	Cell 1	Cell 2	Cell 3
	Subjects or modules	Cell 4	Cell 5	Cell 6
	Competencies or single lessons	Cell 7	Cell 8	Cell 9
	Fully integrated	Cell 10	Cell 11	Cell 12

For educational preparation and bridging courses, an approach based on cell 1 is suggested.

For initial vocational courses, an approach based on cells 4, 5, 6, 7 and 9 is suggested. A long-term objective should be to adopt an approach based on cells 10, 11 and 12. The approach suggested now for existing TAFE vocational courses involves the development of subjects or modules in:

- skills prerequisite to quality;
- general quality principles;
- industry-specific quality principles,

and the development of competencies or single lessons in:

- skills prerequisite to quality;
- industry-specific quality principles.

It is further suggested that the industry-specific quality principles be presented as learning objectives towards the latter half of TAFE vocational courses. This approach will be illustrated for three TAFE vocational courses in a following section.

There is also a need (identified in the industry survey) for short courses in quality to be held over the next 5 to 10 years. Such courses could provide a retraining function for existing employees and would fit cell 2 in the matrix of Figure 5.2. These courses should be distinguished from courses for quality specialists. The suggested short courses would provide training in quality for all employees who have received no prior training in this area. Many potential students for such courses would have previously completed TAFE vocational courses with little or no training in quality concepts.

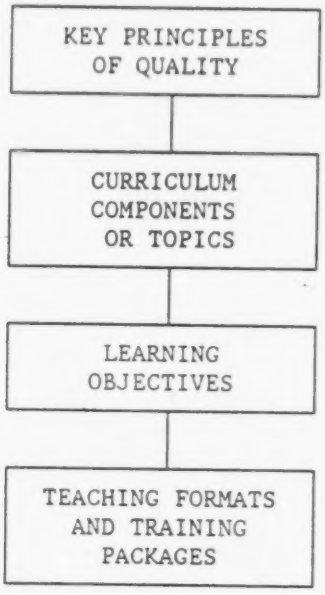
5.3 CURRICULUM DEVELOPMENT

It is suggested that the development of curricula on quality follow the following four steps:

- identifying the key principles of quality;
- developing curriculum components or topics;
- writing of learning objectives;
- specifying the teaching formats and development of training packages.

The four steps are sequential, as shown in Figure 5.3.

FIGURE 5.3: **Steps in the development of curricula on quality**



The key principles of quality are based on modern quality management principles. Eight key principles have been identified by the NIES Quality Education Task Force. These principles which have already been described in detail in Chapter 2 are:

- all systems exhibit variation: stability, capability, control and improvement need to be understood;
- people work within systems: managers must work on the system with the help of everyone in the system;
- everyone serves a customer: quality must focus on customer needs;
- quality does not cost, it pays: the reduction of variation and systematic elimination of waste leads to higher quality, greater customer satisfaction and lower costs;
- control the process, not the output: permanent improvements can be made by standardising, controlling and then improving processes and procedures.
- improvement efforts should be plan-driven, not event-driven: efforts must be directed towards achievement of goals of quality management at all levels;
- management by facts and data: data are essential for solving problems and improving quality. If you can't measure the process you can't control the process;
- improvement should be a way of life: everyone should strive for continuous improvement by constantly seeking better ways;

These principles provide the basis for the development of the curriculum components or topics.

5.4 CURRICULUM COMPONENTS

The approach to determining curriculum components (topics) has been to divide components into the 3 broad categories of prerequisite skills, general quality principles and industry-specific components. The components have been derived from a number of sources (Deming, Juran, other "gurus", AOQC, existing TAFE courses, higher education, consultants and the industry survey results). The industry survey profile of "essential" training skills indicated the need for specific components.

Table 5.1 shows the components (or topics) under the broad categories of:

- prerequisite skills;
- general quality principles;
- industry-specific quality components.

To illustrate the integration of curriculum components on quality, three existing TAFE courses have been selected. It is suggested that the three pilot courses within TAFE be:

- Associate Diploma of Mechanical Engineering;
- Certificate Course - Sheetmetal/Printing Machining;
- Hospitality Course in Hotel Management/Supervision.

The integration of the quality component with existing curricula is being discussed with curriculum experts in the TAFE authorities in these areas. Some of the components may not be appropriate for particular courses but the key principles will be applicable to all.

TABLE 5.1: Curriculum components for integrating quality into TAFE courses.

QUALITY COMPONENTS (or topics)	3 PILOT AREAS OF TAFE							
	ASSOCIATE DIPLOMA IN MECHANICAL ENGINEERING				TRADE CERTIFICATE COURSE eg. Sheetmetal/ Printing			HOSPITALITY COURSES eg. Hotel Bar Service Supervison (Short course)
	STAGE				STAGE			
	1	2	3	4	1	2	3	
1. PREREQUISITE SKILLS								
Interaction Skills	●							
Communication	●	●			●	●		●
Human Relations	●				●			●
Motivation			●				●	
Leadership				●			●	●
2. GENERAL QUALITY PRINCIPLES								
8 Key Principles	●	●	●	●	●	●	●	●
Definitions/Terminology	●				●			●
Historical Background	●				●			●
Customer Needs	●	●	●	●	●	●	●	●
Quality Costs				●				
Quality Design	●	●	●	●				
Reliability	●	●	●	●				
Statistical Quality Control								
— Basic concepts	●				●			●
— Process capability	●	●	●				●	
— Control charts	●	●						●
Tools & Techniques of TQC	●	●	●	●	●	●	●	●
Quality Assurance			●					
Quality Systems				●			●	
— Quality manuals				●				
— Procedures				●				
— Standards				●				
— Audits				●				
— Sampling procedures				●				
Classification of Characteristics or Defects		●						
Inventory Control				●				●
Supplier Relations				●				●
Employee Involvement	●	●	●	●	●	●	●	●
Quality Circles				●			●	
Problem-solving PDCA	●	●					●	
Preventative maintenance				●			●	●
Just-in-Time (JIT)				●				
Value-Added Manufacturing (VAM)				●				

TABLE 5.1 *(Continued)*: Curriculum components for integrating quality into TAFE courses.

QUALITY COMPONENTS (or topics)	3 PILOT AREAS OF TAFE							
	ASSOCIATE DIPLOMA IN MECHANICAL ENGINEERING				TRADE CERTIFICATE COURSE eg. Sheetmetal/ Printing			HOSPITALITY COURSES eg. Hotel Bar Service Supervison (Short course)
	STAGE				STAGE			
	1	2	3	4	1	2	3	
3. INDUSTRY-SPECIFIC SKILLS								
Quality Measurement and Testing			●	●				
Failure Mode Effect Analysis (FMEA)				●				
Reliability Engineering			●	●				
Metrology				●				
MRP II (Manufacturing Resource Planning)				●				
Design of Experiments — Factorial Design — Orthogonal array				●				
Evaluation of Parts				●				

NOTE: These examples are not complete and should include specific skills relevant to industry.

6. PILOT CURRICULA

The purpose of the pilot curricula is to illustrate how quality concepts may be integrated into TAFE vocational courses. A further aim is to provide a basis for the implementation of the teaching of quality in these courses in 1989.

The courses selected for piloting were:

- trade certificate course in sheetmetal;
- associate diploma course in mechanical engineering;
- short course in hotel bar supervision.

The basis for selection was variety in course level and coverage of both the manufacturing and service sectors of industry.

Details of how quality may be integrated into each course follow.

6.1 BASIC TRADE CERTIFICATE (*SHEETMETAL WORKING*)

The Sheetmetal Working Basic Trade Course currently being taught in various colleges of TAFE in South Australia has been selected as a model for the integration of quality and improvement into apprentice courses in TAFE colleges throughout Australia.

It is proposed to offer a total number of twenty hours of managing for quality and improvement in basic trade apprentice courses. Even this relatively small amount of time will be a valuable introduction to the concept of quality at the apprentice level.

The current Sheetmetal Working apprentice course is of eight hundred hours duration and consists of:

Stage 1	320 hours
Stage 2	320 hours
Stage 3	160 hours

Apprentices attend classes on Block Release, that is two weeks by forty hours per week, four times per year in Stages 1 and 2. Stage 3 apprentices attend two periods of two weeks by forty hours per week.

The proposed twenty hours of managing for quality improvement is designed to acquaint apprentices with the principles of managing for quality improvement. An understanding of the importance of the eight key principles and a knowledge of the application of the basic tools and techniques in problem-solving will be a useful introduction to quality management.

The eight key principles are:

- all systems exhibit variation;
- quality does not cost, it pays;
- people work within systems;
- everyone serves a customer;
- improvement efforts should be plan-driven, not event-driven;

- improvement should be a way of life;
- management by facts and data;
- control the process, not the output.

Because the present course is already tightly structured, the integration of twenty hours of quality management will require careful programming. The twenty hours will also have to be absorbed into the existing eight hundred hour course.

The Sheetmetal Working course is project-centred. That is, all practical work, theory, drawing and calculations are completely integrated. Therefore the project-centred structure should adapt readily to the proposed integration of quality management.

Assessment throughout the Sheetmetal Working Course is based on the assumption that quality control in industry is achieved by reworking reject or sub-standard work until the required standard is reached.

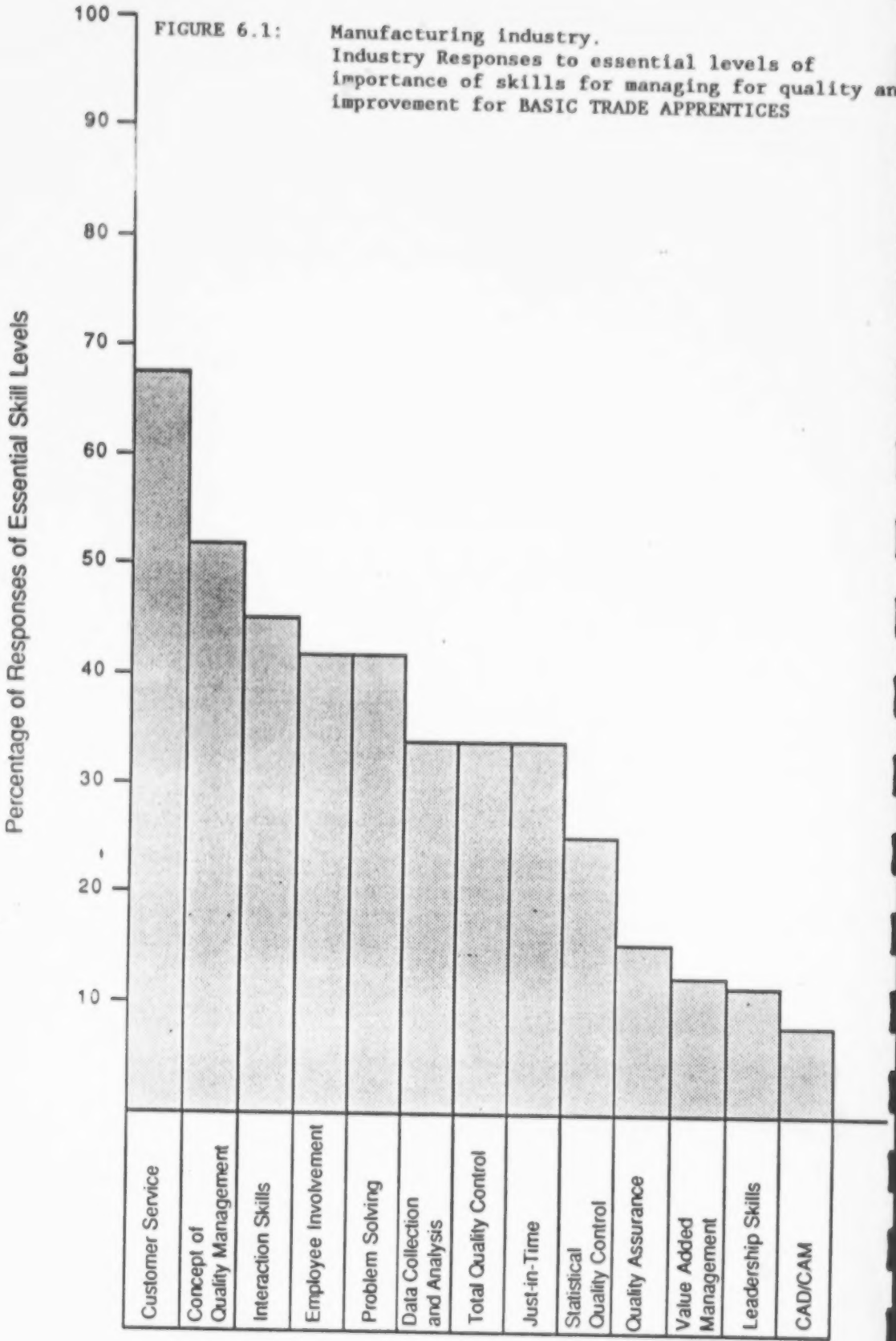
The integration of managing for quality and improvement into the course will undoubtedly be an important key in the reduction and/or the elimination of rejects and will highlight the principle that waste is much broader than just the material costs of scrap and rejects.

The proposed unit of managing for quality improvement is based upon the concepts of:

- tools and techniques for managing for quality and improvement;
- key principles for managing for quality and improvement.
- problem-solving.

Another key factor influencing the proposed component of quality is the level of quality skills required by apprentices as perceived by industry and depicted in Figure 6.1. The responses illustrated are taken from the industry survey (Appendix D).

FIGURE 6.1: Manufacturing industry.
Industry Responses to essential levels of importance of skills for managing for quality and improvement for BASIC TRADE APPRENTICES



The actual mechanism for introducing quality into an apprentice course can be left to individual TAFE colleges. Although there is a national core syllabus for many trades, colleges should have the flexibility to introduce quality at the most appropriate time to suit their individual programmes. However, it is suggested that the concept of managing for quality and improvement be spread over three years as, for example:

. Stage 1	4 hours	Quality Planning
. Stage 2	8 hours	Quality Control
. Stage 3	8 hours	Quality Improvement

This would represent 2 to 3% of total trade course duration (which is about 300 hours per year for 3 years). For those TAFE colleges which prefer to have a separate quality course for apprentices, an alternative proposal is suggested. The twenty hours of managing for quality and improvement can be offered as:

Block Release Students

Two hours per day for ten days. That is, the twenty hours of quality to be accomplished in one block of training. The unit of quality could be introduced into the second block of Stage 2 of an apprenticeship course. At this time in the career of the apprentice, workshop skills will be advanced and the apprentice will have an understanding of the tools and equipment of a particular trade. Manufacturing skills will also be advanced and the apprentice will be able to relate more readily to problem-solving/brainstorming. The apprentice will also, perhaps, be more mindful of the costs of poor quality work skills.

Day Release Students

Day release students generally attend a TAFE college on one day per week for forty weeks in Stages 1 and 2. Stage 3 attendance is one day per week for twenty weeks. It is suggested that day release students undertake the quality management unit of work in Stage 2, commencing on the eleventh attendance and continuing through to the twentieth attendance. Two hours per day, as with block release students, to be utilised for quality management.

In both the proposed and the alternative quality course, the topics to be covered will be the same.

The alternative proposal is particularly suited to pre-vocational students attending a TAFE college full-time.

A suggested syllabus outline for the alternative proposal appears under the heading:

Basic Trade Apprentice Alternative Proposal. (see page 78.)

Basic Trade Apprentice Quality Curriculum

STAGE 1

Unit Title: Quality Planning

Length: 4 hours

Prerequisite: Enrolment in Basic Trade Course or Pre-Vocational Course

Terminal Objectives: On completion of the unit of quality students will be able to:

1 Recognise terms applicable to managing for quality improvement.

2 Grasp the meaning of quality.

3 Use problem-solving techniques.

4 Participate in brainstorming sessions.

5 Acquire knowledge of the key principles of managing for quality improvement.

6 Become acquainted with the tools of quality control.

7 Collect and analyse data.

Topics:

1 Terms associated with managing for quality improvement.

2 Meaning of managing for quality improvement.

3 Problem-solving.

4 Brainstorming.

5 Tools of managing for quality improvement, introduction.

6 Key principles of managing for quality improvement, introduction.

7 Data collection and analysis.

8 Customer needs, internal and external.

Major Texts and References:

1 Deming, W. E. (1986). Out of the Crisis. Cambridge, Ma: Massachusetts Institute of Technology.

2 Dept of TAFE, SA. (1984). Introducing the New Sheetmetal Working Trade Course for Apprentices. Adelaide: Regency College of TAFE.

3 Feigenbaum, A. V. (1983). Total Quality Control. 3rd ed. New York: McGraw-Hill.

4 Ishikawa, K. (1983). Guide to Quality Control. Tokyo: Asian Productivity Organisation: JUSE.

5 Juran, J. N. (1988). Making Quality Happen. Wilton Conn: Juran Institute Inc.

6 McConnell, J. (1986). Seven Tools of T.Q.C. Forestville: Enterprise Australia.

7 National Industry Extension Services. Total Quality Control for Small Manufacturers. Canberra: AGPS.

8. NIES. (1989). Training Package Video and Workbook. Canberra: NIES.

9 NIES. Workforce Involvement: The competitive edge. Canberra: AGPS.

10 Tribus, M. (1988). The Tribus Lectures Australian Tour. Sydney: BHP Coated Products Division.

11 Sprouster, J. (1987). (T.Q.C.) Total Quality Control: - The Australian experience. 2nd rev.ed. Cammerary, NSW: Horwitz Grahame.

SO

STAGE 2

Unit Title: Quality Control

Length: 8 hours

Prerequisite: Stage 1 Basic Trade Course or Completion of Pre-vocational Course.

Terminal Objectives: On completion of the unit of quality students will be able to:

1 Develop further the skills of problem-solving in groups.

2 Collect and analyse data using seven tools of total quality control.

3 Analyse eight key principles of quality.

4 Understand concept of variation and recognise differences between "special" and "common" causes.

5 Monitor a process using a run chart.

6 Construct a histogram to show a process capability.

7 Understand importance of employee involvement and principles of quality control.

8 Use problem-solving in selected case studies.

Topics:

1 Interaction skills - Communication, human relations.

2 Group problem-solving - Introduction to Quality Circles.

3 Tools of Total Quality Control.

4 Data collection and analysis - Use of cause and effect analysis.

5 Significance and implications of the eight key principles.

6 Statistical process control.

Major Texts and References:

Refer to Stage 1.

STAGE 3

Unit Title:	Quality Improvement
Length:	8 hours
Prerequisites:	Stage 2 Apprentice Course
Terminal Objectives:	On completion of the unit of quality students will be able to:

1 Grasp concepts of quality in design, reliability and customer needs.

2 Apply principles of process capability and process intent to workplace.

3 Have knowledge of workforce involvement - Further develop Quality Circles and other strategies for improvement.

4 Use PDCA (Plan, do, check, act) cycle for problem-solving (KAIZEN).

5 Develop interaction skills.

6 Understand quality assurance - Introduction to systems/Australian Standards.

7 Be aware of principles and use of JIT (Just-In-Time).

8 Recognise concept of VAM (Value-Added Manufacturing).

9 Use case studies to further understand and apply key principles for quality and improvement.

Topics:

1 Quality in design, reliability.

2 Workforce involvement.

3 Process capability/process intent.

4 PDCA Improvement cycle - Interaction skills.

5 Quality assurance: Australian Standards 9000 series.

6 Principles and uses of JIT - Just-In-Time.

7 Principles of VAM - Value-Added Manufacturing.

8 Case studies.

Major Texts and References:

Refer to Stage 1.

Basic Trade Apprentice Alternative Proposal.

SUBJECT: Managing for Quality and Improvement

Length: 20 hours, integrated into basic trade course.

Prerequisite: Enrolment in basic trade course, or, pre-apprenticeship course.

Terminal Objectives: On the completion of the unit of managing for quality and improvement students will be able to:

1. Recognise terms associated with quality improvement.
2. Use the key principles of management for quality improvement.
3. Become acquainted with the tools of quality management.
4. Use problem-solving techniques.
5. Participate in brainstorming sessions.
6. Collect and analyse data.

Topics:

1. Terms associated with quality management.
2. Eight key principles of quality management.
3. Data collection and analysis.
4. Case studies involving the seven tools of total quality control.

Major Texts and References:

As for Stage 1.

6.2 ASSOCIATE DIPLOMA IN MECHANICAL ENGINEERING (A.D.M.E.)

The Mechanical Engineering course has as its prime responsibility, the education and training of para-professional graduates in that field. The course is designed to assist students to develop the required understanding, personal abilities, manual skills and emotional awareness to enable them to undertake their chosen career. The integration of quality into this course will have a general application in other engineering courses and para-professional courses in TAFE.

Mechanical Engineering courses in most states have core subjects such as engineering mathematics and engineering mechanics, engineering materials, workshop practices, engineering drawing and design and communication. These subjects are common to other Associate Diploma courses such as Production Engineering or Electrical Engineering. It is also during this foundation stage of the course that the students will be guided towards an appreciation of the role of mechanical engineering in industry, and how they, as engineering technicians relate to other levels of the workforce. Quality principles and concepts should be part of the core curriculum.

Current courses - Associate Diploma in Mechanical Engineering

The course length varies from state to state as does specific subject content. (1258 to 1547 hours).

It can be taken 2 years full-time or 4 years part-time in most states.

The Associate Diploma in Mechanical Engineering course at Regency College of TAFE in South Australia has been used as a model for integrating quality into the curriculum. Figure 6.2 shows the flowchart of the diploma courses and the three career paths which students can take. The outline of subjects common to all courses and specialist subjects is shown in Table 6.1. It is appropriate that quality be integrated into common core subjects.

A specialist subject 'Quality Control' (Table 6.2) is provided as an elective at Regency College. It is recommended that all students are taught key principles and concepts of quality. Separate quality courses in the present curriculum should be designed for advanced or specialist quality topics. Quality control subjects are provided in some courses as electives, e.g. Quality Control is an 108 hours elective at Regency College.

Currently the integration of quality into courses appears not to be common practice. There is considerable development of separate courses in quality particularly in NSW, Victoria and South Australia. Resources and syllabi are therefore already available within TAFE. However, there is a need for an integrated approach beginning with core curriculum so that quality does not remain an optional subject.

As previously indicated considerable expertise and resources in the field of quality already exist in TAFE throughout Australia. Footscray College (Victoria), Sydney College (NSW) and Regency College (SA) provide specialist courses at the Associate Diploma level. Several reports have been submitted within TAFE covering this topic. They are entitled Quality Control and Quality Assurance (Lewis 1985) and The Need for Quality in TAFE Courses (Cresshull 1986).

FIGURE 6.2: Flow chart for the Mechanical Engineering Associate Diploma cour
(Regency College of TAFE, SA)

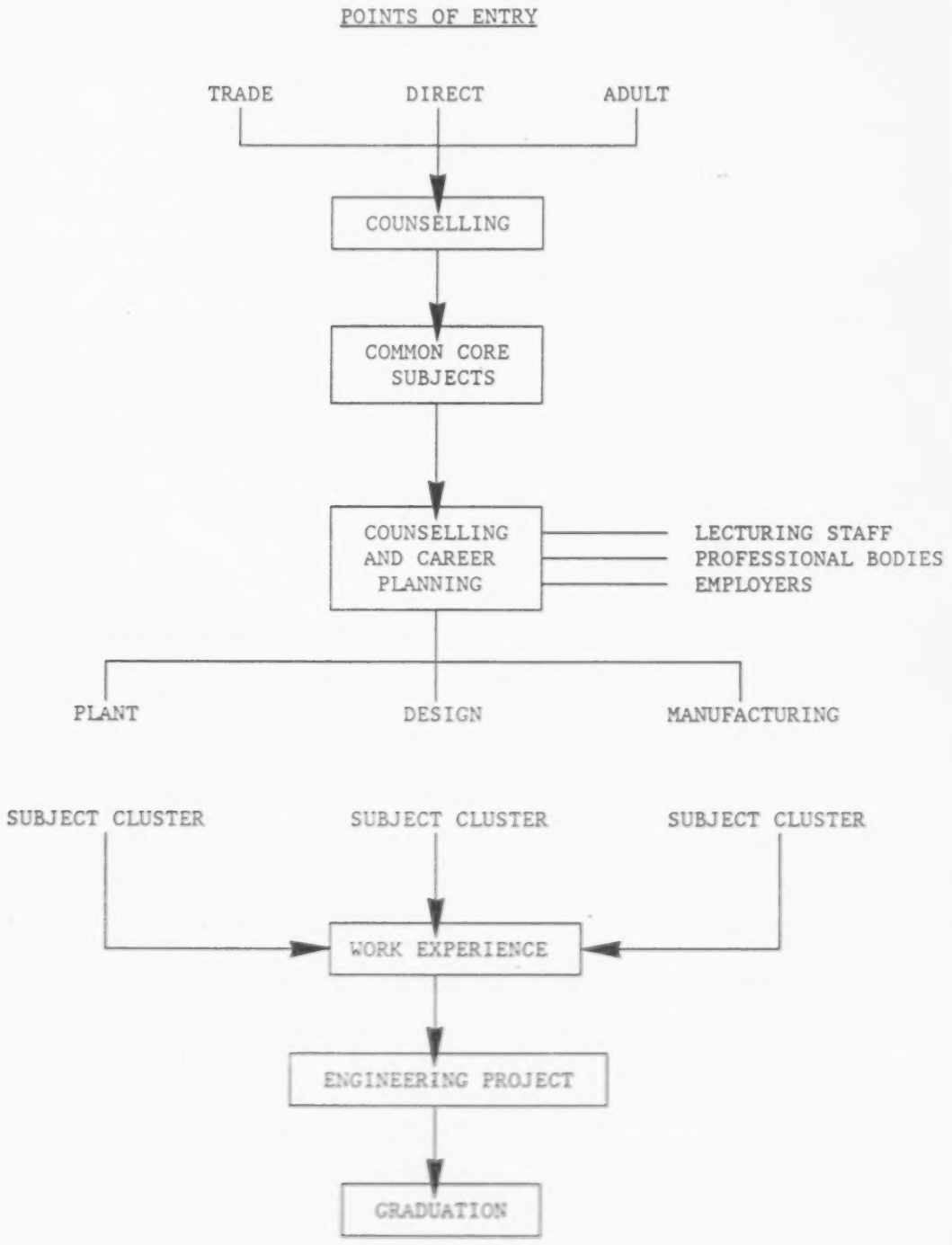


TABLE 6.1: Syllabus of the Mechanical Engineering Associate Diploma courses (Regency College of TAFE, SA)

GENERAL

Course Aims

To develop skills to enable the Graduates to use current and evolving technologies.

To equip the Graduate with the skills and abilities needed to adapt to and acquire further expertise in the development in Technology.

To allow the graduate to have sufficient applied knowledge to work with Engineers, Technicians and Trades persons.

To apply theory and practice to Industrial problems using relevant facilities and situations.

Three Associate Diplomas are offered namely

Associate Diploma - Plant Engineering
Associate Diploma - Design Engineering
Associate Diploma - Manufacturing Engineering

SCHEDULE OF SUBJECTS

A SUBJECTS COMMON TO ALL COURSES

Engineering Maths 1
Engineering Mechanics 1
Eng. Drawing and Design 1
Workshop Practice (29 weeks)
Intro. to Digital Comp. (20 wks)
Communication
Engineering Materials
Physics of Engineering
Measurement

B SPECIALIST SUBJECTS

On completion of the common core subjects students are required to select subjects on the basis of a career path and specialist area of study. Information from professional bodies on grouping of subjects to meet membership requirements together with counselling will be required by the students at this stage. This is to determine which Associate Diploma the student is contracted to complete.

For guidance, a list of specialist subjects follow together with an indication (*) as to which of the Associate diplomas they are applicable.

SPECIALIST SUBJECTS	DESIGN	MANUF.	PLANT
Eng. Mechanics 2	*		*
Struct. Mechanics 2	*		*
Eng. Maths 2	*	*	*
Eng. Drawing & Design 2	*		*
Struct. Drawing & Design 2	*		*
Eng. Drawing & Design 3	*		
Struct. Drawing & Design 3	*		
Manufacturing Technology	*	*	
Heat Engines	*		*
Electro Mechanical Systems	*		*
N.C. Programming and Practice		*	
N.C. Tooling and Machining		*	
Computer Programming		*	
CIMM Systems		*	
Computer Aided Systems - Management		*	*
Computer Aided Systems - Manufacture		*	*
Computer Aided Systems - Drawing & Design	*	*	*
Production Planning & Control		*	*
Quality Control	*	*	*
Construction Practice	*		
Manufacturing Analysis	*	*	
Corrosion Prevention	*	*	*
Materials Handling	*	*	*
Applied Fluid Power	*		*
Robotics 1	*	*	*
Analysis of Structures 1	*		
Analysis of Structures 2	*		
Refrigeration, Heating & Air Conditioning	*		*
Maintenance Management		*	*
Fortran 1	*		
Plastics Materials	*	*	*
Technology of Plastics Processes	*	*	*
C.A. Plastics Process		*	*
Tools and Fixture Design	*	*	
Project Management		*	*
Product Design	*	*	
Electrical Technology	*	*	*
Introductory Electronics	*		
Digital Electronics	*		
Elementary Surveying	*		
Production Organisation		*	*
Engineering Management	*	*	*
Computer Aided Design 1	*	*	
Computer Aided Design 2	*	*	
Industrial Control	*	*	*

TABLE 6.2: Associate Diploma in Mechanical Engineering - Regency College, South Australia

TITLE: Quality Control TIME: 108 hours (Lectures/tutorials/projects)

AIM:

To establish the fundamental principles of Quality Assurance and assist the student to develop ability to apply basic quality control techniques.

OBJECTIVES:

At the completion of this subject, the student should be able to:

Develop the framework of a quality plan;
Use basic problem solving techniques to manage quality problems typical of the manufacturing sector;
Select appropriate approaches to be used in the control of quality;
Analyse quality data is a systematic manner and identify the controlling variables;
Measure process capability, and relate this to a product AQL;
Prepare mean and range control charts, and identify typical problem patterns using the charts.

TOPICS:

Introductory concepts; policy; planning for quality; cost of manufacture and failure; approaches to cost reduction.
Australian Standards 1821-23 and their objectives.
Implementation of quality assurance systems; approaches to the control of quality; classification of problem types, cause/effect diagram.
Characteristics of people orientated approaches, quality circles and their development.
Communication and management credibility; control of vendor quality.
Collection and presentation of data; statistical parameters; probability distributions and interval estimators.
AQL and fraction defective. Theory and practice of acceptance sampling; process and AQL.
Types of sampling plans and their application.
Defect analysis; calculation of levels of defective material, preparation and use of control charts; control charts as diagnostic aids.
Theory and application or PRE-Control.

TEXT BOOKS:

The following Australian Standards

AS 1821-23	Suppliers Quality Control Systems, 1975
AS 2000	Guide to AS1821-23, 1978
AS 1199	Sampling Plan Tables - Attributes, 1972
AS 1399	Guide to AS1199, 1973

Outline of relevant research findings

The need for quality is widely recognised in industry and TAFE. The research findings in the manufacturing survey of industry supported both "separate quality courses" and "integrating quality into existing courses". The industry survey was targeted at companies which had been involved in quality management strategies for at least 2 years. Many of the companies were in the engineering field and ranged from 10 to 500 + employees. The profile of technical staff essential training skills would include mechanical engineering students.

The Pareto Chart (Figure 6.3) indicates the responses to essential skills in order of importance for technical staff. It shows overall, the high degree of significance placed on quality and improvement skills generally. The curricula components in quality will reflect these industry needs.

The current curricula for mechanical engineering students in most states focuses on technical skill requirements for engineering. However, the survey findings show that essential skills are data collection and analysis (92%), customer service (87%), problem-solving (87%), concepts of quality management (83%), interaction skills (79%), and statistical quality control (79%). Conversely, the low degree of emphasis on CAD/CAM (42%), JIT (42%), VAM (38%) MRPII (21%) indicates that these new technologies are not viewed as "essential" skills in industry despite specific applications in many companies.

The curriculum components for the Associate Diploma in Mechanical Engineering can be arranged as the curriculum framework suggests into three broad categories.

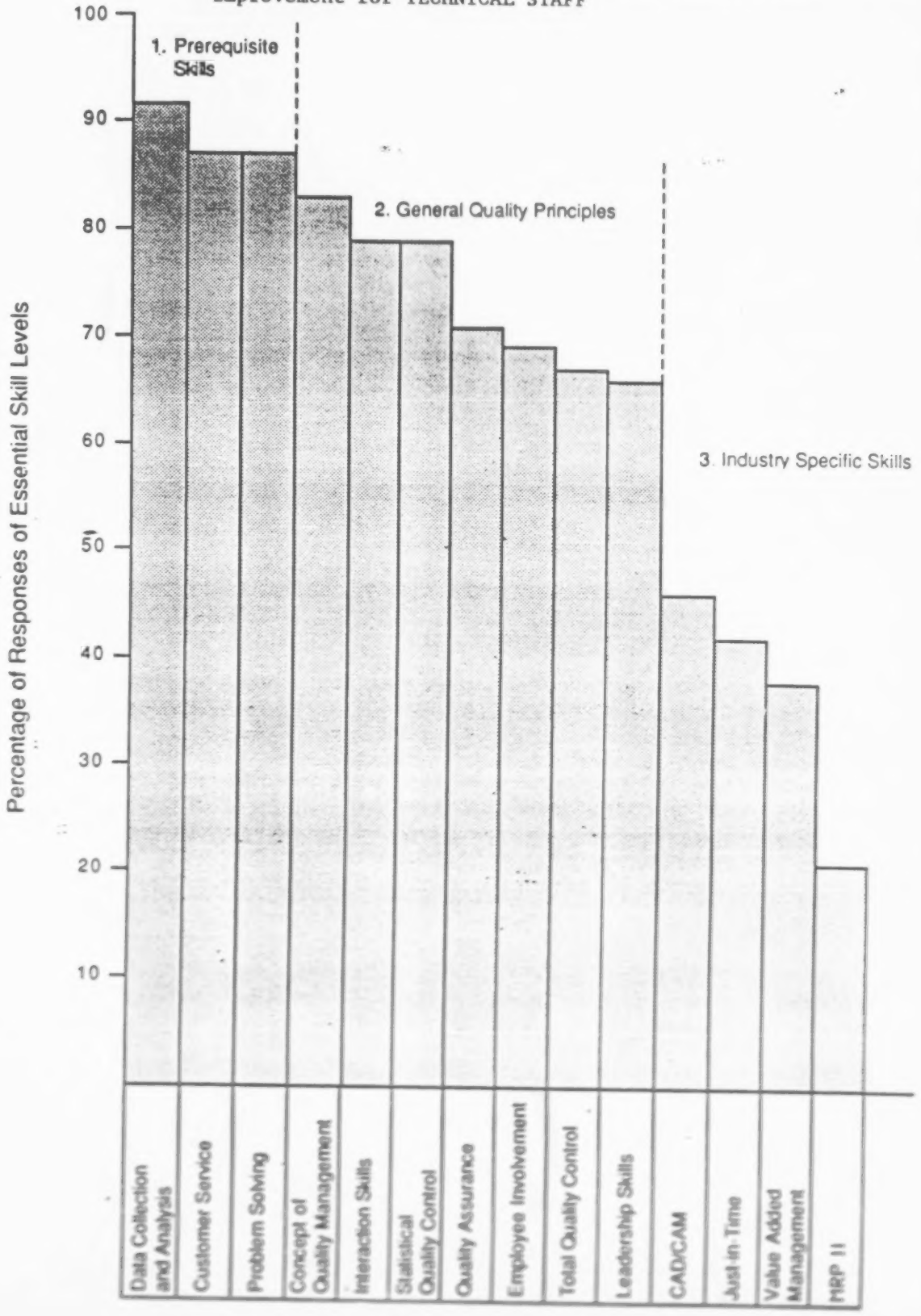
1 Prerequisite Skills.

2 General Quality Principles.

3 Industry-Specific Skills.

The industry survey responses from technical staff reflect this basic approach. The Pareto Chart shows the priorities needed in curriculum development.

FIGURE 6.3: Manufacturing industry.
Industry Responses to essential levels of importance of skills for managing for quality and improvement for TECHNICAL STAFF



Extracts from various reports support the inclusion of quality in courses such as the Associate Diploma in Mechanical Engineering.

The Foley Report raised a number of issues:

> Some of the major criticisms of current education arrangements provided to the committee were:
>
> - the lack of sufficient quality related subjects/units/courses available in high schools and higher education institutions;
>
> - specifically, the lack of attention to practical statistical methodology, particularly in university courses in engineering, science and administration/management;
>
> - the uncoordinated approach to education on quality matters.
>
> - the need for higher education institutions to directly align courses to the practical needs of industry e.g. process capabilities, measure of dispersion, problem-solving etc. Associated with this is the requirement for educators to keep abreast of modern quality principles. (Foley 1987, p.39).

The TAFE National Curriculum Project Quality Control and Quality Assurance (Lewis 1985) produced the following findings, conclusions and recommendations:

1. The ACT, Northern Territory, Tasmania and Queensland offer no courses of consequence.

2. Western Australia, South Australia and Victoria each offer a short or special course in quality control. New South Wales offers six different special or short courses.

3. Technician level courses containing quality control subjects are offered in Victoria and New South Wales. Three Victorian courses contain core units and one offers an elective unit. In New South Wales, core units are offered in four technician level courses, but no elective units are available.

4. At the higher/further/post-certificate level, Victoria offers one complete course in quality control, and New South Wales five courses with quality control subjects.

5. The quality control courses and subjects available are almost entirely in manufacturing related areas. There are none in trade courses and only one in a management supervision course.

6. <u>There is a need for an introductory quality control subject in all technician level courses.</u>

7. <u>There is a need to include a quality control subject in all technician level courses.</u>

8. Industry does not generally support post-certificate courses in quality control and quality assurance.

9. Industry does not generally support higher certificate courses.

10. The provision of quality control education at technician level can be catered for within existing course structures. However, the provision at trade and non-technician levels requires a new structure, preferably national.

11. Although the three different industry groups with experience in quality control operate from somewhat divergent perspectives, these industry bodies should all be consulted when TAFE proceeds to formulate courses in quality control.

The Australian Organisation for Quality Control (AOQC) conducted a survey in 1987 of small to medium manufacturing plants located in New South Wales. 200 personal interviews with executives of small to medium manufacturing plants were conducted in order to examine their quality systems, procedures, profitability and attitudes to quality. Major findings of the study were as follows:

- a strong, positive correlation was found between the existence of a documented quality system, the use of in-house quality training, the practice of total quality control (TQC), system and process audits, use of statistical procedures, on the one hand, and profitability on the other, as measured by return on investment;

- in particular, plants with a documented quality system had significantly higher return on investment than those without such a system (23.9% vs. 14.0%);

- the corollary is that if plants improve training, quality systems, procedures and documentation, then a long-run improvement in profitability can be expected;

- 25 percent of respondents did argue that government should become involved in the promotion of quality and/or quality training.

Associate Diploma students at a TAFE college in South Australia were asked their opinion relating to the need for quality in courses. The students came from industries which have a diverse range in their application of quality principles. One interesting comment was that the needs of internal customers should be more fully evaluated. Another issue raised was that emphasis should be on capability, tolerances and specifications rather than Acceptable Quality Levels (AQLs). Students all benefited from an engineering project in which the quality principles and techniques could be applied in final year. A notable outcome of the project was the production of a video, *Quality Circles in South Australia* (Hemsley and Zagar 1987), which would be useful as a resource.

Cresshull made the following recommendations on the need for quality to be included in all TAFE courses:

1. That TAFE begin addressing, as a matter of urgency, the provision of quality control education into its courses.

2. That subject material be prepared for all initial vocational courses (that is, stream 3000 courses), introducing the concepts of quality and quality control.

3. That subjects be developed which may be aggregated such that:

   3.1 Specific quality control applications can be included in existing courses.

   3.2 A course can be developed for those people seeking education for quality control at Associate Diploma level.

3.3 Specific subjects can be taken as post-certificate studies at the advanced certificate level (that is, stream 3300) for such occupationas as quality control inspectors etc.

3.4 That a range of subjects be developed as endorsement subjects subsequent to an associate diploma course (that is, stream 4400), with specific emphasis on management of quality.

4. That 'short courses' at operative level (that is, stream 4100) be developed for specific occupational needs where demand can be established.

5. That a pilot program of an initial vocational course (that is, at the stream 3000) level be conducted for evaluation in an area of prime need.
(Cresshull 1986, p.1).

Outline of proposal

The curriculum development approaches for the Associate Diploma in Mechanical Engineering are shaded (Figure 6.4).

FIGURE 6.4: **Matrix of curriculum development approaches based on quality skill category and course structure arrangements.**

		QUALITY SKILL CATEGORY		
		SKILLS PREREQUISITE	GENERAL QUALITY PRINCIPLES	INDUSTRY SPECIFIC QUALITY PRINCIPLES
COURSE STRUCTURE	1. Whole courses in quality	Cell 1	Cell 2	Cell 3
	2. Subjects or modules	Cell 4	Cell 5	Cell 6
	3. Competencies or single lessons	Cell 7	Cell 8	Cell 9
	4. Fully integrated	Cell 10	Cell 11	Cell 12

Prerequisite skills will be fully integrated (Cell 10) into the course. General principles will be a core subject (Cell 5) and competencies or single lessons (Cell 8) will be integrated into appropriate subjects. The long-term goal is to fully integrate quality concepts and principles into all of the course (Cell 11). Industry-specific quality principles can be taught as separate whole courses (Cell 3) or as subjects or modules (Cell 6).

Approaches to curriculum development

Whole courses in quality (Cell 2) This approach is not recommended for principles of quality and improvement. Quality should not be viewed in isolation. The only exceptions may be in specialist courses designed as accreditation for quality engineers or technicians.

Subjects or units (Cell 5) This approach is proposed in order to introduce general principles to all mechanical engineering students. 6 units have been recommended as components of a core subject - MANAGING FOR QUALITY AND IMPROVEMENT.

Competencies or single lessons (Cell 8) This approach is recommended in order to integrate components and principles into appropriate subjects.

Fully integrate quality into all of course Certainly, this is the goal for curriculum development in quality. The implementation of a fully integrated approach requires considerable change. Staff development in quality for TAFE administrators, senior lecturers and lecturers is essential in quality concepts and principles. The support of TAFE administrators needs to be demonstrated by the appropriate allocation of time and resources to curriculum developers and lecturers.

The syllabus guidelines for integrating quality into curriculum are outlined as follows.

Prerequisite skills

It is seen as a distinct advantage for the study of Quality subjects that students have some formal education in:

- interaction skills (communication, listening)
- group skills
- team work
- human relations/motivation.

Entry to Associate Diploma level courses requires satisfactory completion of Year 12 or satisfactory completion of Year 11 and completion of an engineering trade certificate; experience in industry; or mature age (20 years or over) entry. The prerequisite skills may have been taught or acquired to some level. However, as far as these skills relate to quality it is doubtful whether any students would have had any formal training.

Quality education training should ideally begin with practical applications of the key principles within workshop projects. It is suggested that in Stage 1 of the Associate Diploma the quality principles be applied within all subjects as the prerequisite to more formal training on the subject. The objective is for students to grasp an understanding of what quality means before being exposed to more conceptual principles.

The long-term objective is an understanding of quality concepts and principles and should ideally be integrated into <u>all</u> subjects at Associate Diploma level. It is appropriate that curricula be first developed in particular subjects. A 'project-by-project' approach is fundamental to successful integration.

General principles

Quality Management will be a core subject in the Associate Diploma (Cell 5) for all students. It would be completed in Stages 1, 2, 3 of the course. The syllabus would be 72 hours of key principles, concepts and application of quality. This represents 4 to 6% of the total course duration.

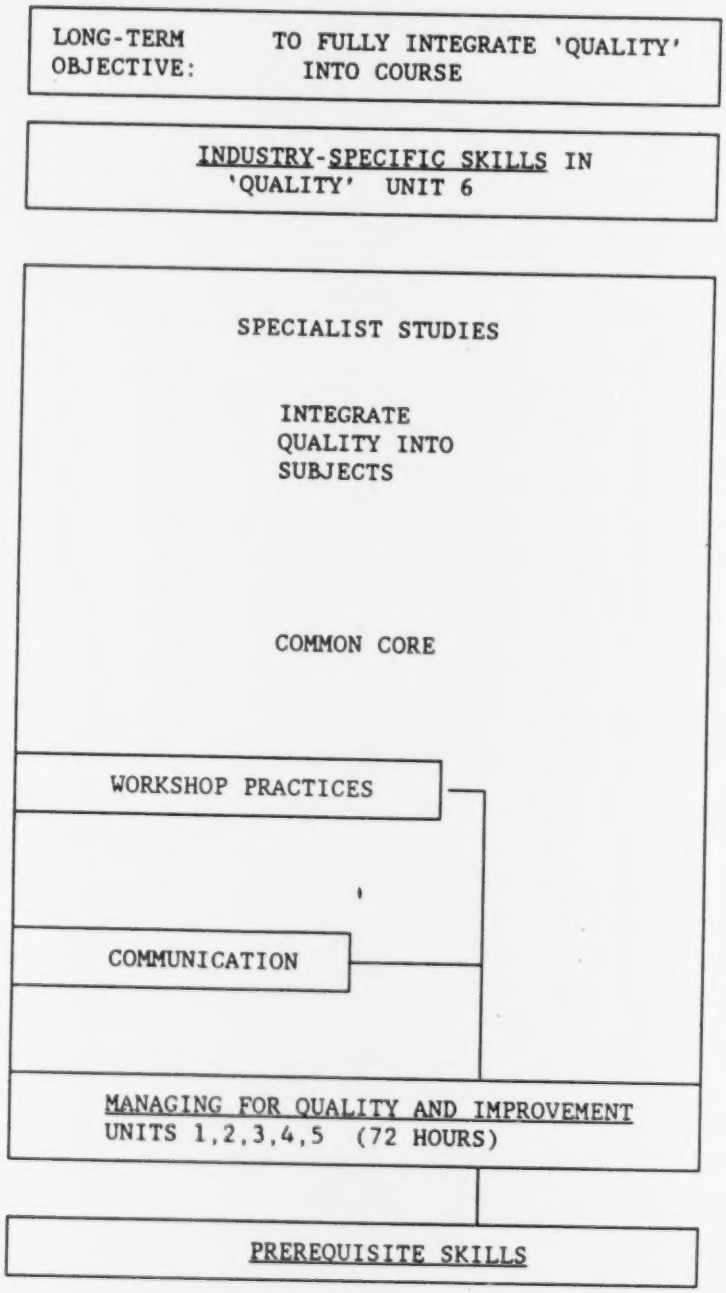
The model developed by Errol Cresshull in *The Need for Quality in TAFE* has been expanded to illustrate the approach to curriculum development in the course (Figure 6.5).

Industry-specific skills

The elective subjects provided in some Associate Diploma Courses offer 'Quality Control' as a subject. It is proposed that all students will have completed a General Quality Principles subject in Stages 1, 2 and 3 of the Associate Diploma (72 hours). The final Stage 4 subjects should be selected from a 'menu' of industry-specific components or topics in the field of quality.

FIGURE 6.5: Approach to course structure

ASSOCIATE DIPLOMA IN MECHANICAL ENGINEERING



Outline of proposal

It is proposed that the subject on quality be identified as:

Managing for Quality and Improvement (72 Hours)

The title reflects and embraces many strategies such as TQC (Total Quality Control), JIT (Just-In-Time), Quality Circles, SPC (Statistical Process Control), VAM (Value-Added Manufacturing) etc. These are widely acknowledged as subsets of a total approach to managing for quality and improvement. The curriculum will incorporate many of these strategies, tools and techniques based on the work of many quality practitioners. The use of acronyms such as "TQC" will be avoided since they can be interpreted in different ways throughout industry.

The work of quality practitioners such as Shewhart, Feigenbaum, Deming, Juran and Ishikawa has been significant and references should be made to their contributions without bias towards any approach to quality and improvement.

The curriculum components have been divided into six units of:

UNIT 1	QUALITY PLANNING	8 hours
UNIT 2	QUALITY CONTROL	8 hours
UNIT 3	QUALITY IMPROVEMENT	8 hours
UNIT 4	STATISTICAL QUALITY CONTROL	24 hours
UNIT 5	ADVANCED QUALITY IMPROVEMENT AND MANAGEMENT	24 hours
UNIT 6	INDUSTRY-SPECIFIC - ELECTIVES IN QUALITY	36 hours

The 'Key Principles of Quality' are the framework for curriculum development.

FIGURE 6.6: Distribution of hours for the core subject 'managing for quality improvement' within the Associate Diploma in Mechanical Engineering

UNIT 1 QUALITY PLANNING	UNIT 2 QUALITY CONTROL	UNIT 3 QUALITY IMPROVEMENT	UNIT 4 STATISTICAL PROCESS CONTROL	UNIT 5 QUALITY MANAGEMENT	UNIT 6 INDUSTRY-SPECIFIC QUALITY ELECTIVES
8	8	8	24	24	36

ASSOCIATE DIPLOMA IN MECHANICAL ENGINEERING

CORE SUBJECT: MANAGING FOR QUALITY AND IMPROVEMENT

Unit 1: Quality Planning

Length: 8 hours

Prerequisites: Basic Trade Certificate
Year 12

Terminal Objectives: On completion of the unit of quality planning students will be able to:

1 Recognise terms associated with quality improvement.

2 Grasp the meaning of management for quality improvement.

3 Use the key principles of management for quality improvement.

4 Recognise the concept of 'who is the customer?'

5 Identify the costs involved in quality.

6 Apply the principles of quality management in design.

7 Use the tools of managing for quality improvement in selected case studies.

8 Apply the skills of problem-solving in groups.

9 Recognise the costs of quality in an organisation.

10 Understand quality requirements for design.

Topics:

1. Terms associated with managing for quality improvement.

2. Meaning of managing for quality improvement.

3. Key principles of managing for quality improvement, introduction.

4. Customer needs, internal and external.

5. Quality costs.

6. Quality in design.

7. Tools of managing for quality improvement, introduction.

8. Data collection and analysis.

9. Problem-solving - case study.

CORE SUBJECT: MANAGING FOR QUALITY AND IMPROVEMENT

Unit 2: Quality Control

Length: 8 hours

Prerequisites: Basic Trade Certificate
Year 12

Terminal Objectives: On completion of the unit of quality control students will be able to:

1 Develop interaction skills - communications, human relations.

2 Apply basic quality circle techniques in problem-solving.

3 Use the tools of total quality control in data collection and analysis.

4 Use statistical control charts to monitor a process.

5 Understand differences between 'common' and 'special' causes of variation.

6 Construct a histogram to understand process capability.

7 Show importance of reliability and maintainability to quality.

8 Understand inspection in contrast to quality improvement and prevention in terms of developing a quality system.

Topics:

1. Interaction skills - communication, human relations.

2. Group problem-solving - introduction to Quality Circles.

3. Tools of Total Quality Control.

4. Data collection and analysis - use of Cause and Effect analysis.

5. Significance and implications of the Eight Key Principles.

6. Statistical process control.

7. Process capability.

8. Reliability and maintainability.

9. Quality system.

CORE SUBJECT:	MANAGING FOR QUALITY AND IMPROVEMENT
Unit 3:	Quality Improvement
Length:	8 hours
Prerequisites:	Basic Trade Certificate Year 12
Terminal Objectives:	On completion of the unit of quality improvement students will be able to:

1 Recognise that the principles of quality in design will lead to reliability of the product.

2 Develop skills in interaction and group problem-solving.

3 Use process capability/process intent as tool for improvement.

4 Use the PDCA problem-solving methodology of quality improvement.

5 Recognise the application of Australian standards and specifications in developing quality systems in manufacturing.

6 Develop appreciation of other strategies for quality improvement such as VAM, JIT and TPM.

Topics:

1. Quality in design, reliability.
2. Workforce involvement
3. Process capability/process intent.
4. Improvement Cycle - problem-solving.
5. Quality assurance: Australian Standards AS 3900/1509000 series.
6. Principles and uses of JIT - Just-in-Time.
7. Principles of VAM - Value-Added Manufacturing.
8. Principles of TPM - Total Productive Maintenance.

CORE SUBJECT:	MANAGING FOR QUALITY AND IMPROVEMENT
Unit 4:	Advanced Statistical Process Control
Length:	24 hours
Prerequisites:	Completion of Units 1, 2, 3
Terminal Objectives:	On completion of the unit of quality students will be able to:

1 Use statistical methods and engineering techniques to identify and reduce common and special causes of poor quality and waste.

2 Analyse data in a systematic way to identify variation.

3 Apply basic problem-solving techniques to case studies.

4 Measure process capability.

5 Prepare control charts for variables and attributes.

6 Understand the application of Australian Standards series 9000.

7 Develop the framework of a quality system.

Topics:

1. Data collection.
2. Pareto charts.
3. Histograms.
4. Correlation analysis and regression analysis.
5. Cause and effect diagrams.
6. Run charts.
7. Control charts.
8. Process capability.
9. Process intent.
10. Australian Standards AS 3900/1509000 series - Quality assurance systems.
11. Supplier relations.
12. Sampling methods for attributes and variables.

CORE SUBJECT:	MANAGING FOR QUALITY AND IMPROVEMENT
Unit 5:	Quality Improvement and Management
Length:	24 hours
Prerequisites:	Completion of Units 1, 2, 3
Terminal Objectives:	On completion of the unit of quality students will be able to:

1 Explain the philosophy of Total Quality Management and relationship with statistical quality control, employee involvement and industrial engineering activities.

2 Identify the principles and techniques involved in Just-In-Time manufacturing.

3 Recognise how to minimise downtime by total preventive/productive maintenance.

4 Develop a plan for implementation of a Total Quality Management programmme in an organisation.

Topics:

1. Total Quality Management - implementation.
2. JIT - Just-In-Time use and principles.
3. Demand pull systems.
4. Set up reduction.
5. Leadtime reduction.
6. Cell technology.
7. Principles and use of MRP II Materials Resources Planning.
8. Total preventive/productive maintenance.

Ways to integrate quality - general applications

The concepts and principles of quality management need to be reinforced in practical situations within other subjects to enable students to fully grasp their relevance and importance. It is recommended that quality principles be integrated into all basic skills subjects. Two core subjects common to engineering curriculum have been selected. The subject syllabus for Communication and Workshop Practice will be reviewed to look at ways of integrating quality principles.

Teaching strategies at basic skills level

The objective is for students to be able to:

- recognise terms and concepts of quality applied to practical situations;
- assess higher level of skills acquisition in terms of quality improvement;
- understand importance of ongoing improvement in quality;
- recognise and meet the customer requirements at each stage of skills acquisition;
- develop teamwork, problem-solving abilities;
- use simple tools of quality management for problem-solving.

The use of keywords and concepts will enable students to become familiar with principles of quality and improvement. A topic should be introduced in the context of the *system* and *processes* associated with it. Students should be aware of their responsibilities and the requirements of lecturers. The *customer* requirements (*industry needs*) should be paramount in all skills acquisition.

Attention should be given to *facts* and *data* available on the topic and those areas where students will be expected to find information, seek approval, discuss aspects with lecturer. *Standardised* procedures should be clearly outlined. Specifications, tolerances and capability of tools, equipment and processes can be explained. Standards may be mandatory for a particular task, but improvement ideas should be openly encouraged and discussed.

Assessment for each session should provide students with an opportunity for self-assessment and improvement. Assessment should be made in the context of CUSTOMER (lecturer and industry) REQUIREMENTS. Criteria such as reliability, repeatability, number of defects, price related to value and service, should be assessed where applicable. Time taken and presentation (CUSTOMER SERVICE) should be evaluated as students progress. The cost of remake of a project in terms of time, materials, resources can be measured in terms of VALUE ADDED to the project or task.

A comparison of QUALITY can be achieved by testing outcomes against CUSTOMER model. A profile of class results (e.g. histogram) may reveal variation, quality of skills acquired within class, range of variation, difficulties to arrive at required results. The overall class result should be emphasised rather than individual achievements. Teamwork should be encouraged to foster corporate responsibility in the acquisition of new skills. Improvement ideas and possible ways to improve on final results should be actively encouraged in group problem-solving sessions.

Example: Look at range of variation in quality and progress of students on a particular project.

Causes for variation could be discussed with students. These could include lack of correct tools, poor materials, delays in use of equipment, distractions in class, lack of interest, different levels of experience within class. This could lead to identifying 'SPECIAL' and 'COMMON' causes of variation. An examination of the case of a slow student with poor practical results showed he was left-handed. The reason or SPECIAL CAUSES of slow progress was lack of left-handed tools and vices mounted on benches. The method of improvement could be to provide facilities for left-handers or alternatively look at COMMON CAUSES such as insufficient skills instruction for left-handers or training in standard methods.

This strategy is designed to reinforce the importance of such concepts as standardisation, the adoption of procedures and methods which are consistent, evaluation of reasons for poor performance, recognition of waste time and materials and examination of class results and opportunities for improvement. The concept "doing it right first time" should be reinforced by the dissatisfied customer (lecturer) and reflected in assessment. The cost of remake, rework should be understood. The principle QUALITY DOES NOT COST, IT PAYS must become evident to students. Shortcuts and inferior quality results should be rejected and done again.

Simple tools of TQC can be introduced by lecturers. Items such as checksheet of defects on projects, pareto to show major defects, run chart of progress on projects, checklist of skills acquisition, process or equipment capability histograms or scatter diagrams which show relationships between variables all demonstrate the principles of quality control.

The concept for integrating quality should not need any justification. The successful integration of the principles requires that lecturers relate quality concepts and principles to topics within their specific subjects.

Ways to integrate quality in workshop practice

Workshop Practice is a core subject in all A.D.M.E. courses and its broad aim reflects many principles of Quality Management. The appreciation of the capabilities and limitations of hand and machine tools relates directly to variation, capability, specifications and tolerances. The aspect of safe working in a workshop environment is a dimension of quality of working life. Cause and effect analysis, standardised procedures, human relations, communication, motivation and safety all apply when people work within a system.

The use of hand and machine tools and workshop layout are important factors in avoiding time waste, gaining easy access to tools and using equipment. Planning and organising oneself and environment also relates to the quality. Selection of the right tools for the job requires meeting customer needs (industry) in the task at hand. Awareness of alternative equipment, tools or improved methods available should be part of the learning process. Simple components produced in this subject should be assessed according to quality principles. Look at customer specifications, attributes, variables of final results. Tolerances and specifications are stressed within this subject but capabilities analysis should also be introduced to students. The use of a class profile to show variations in results or process capability, and their comparison with customer specifications for assessment purposes may be applicable in some exercises. Safety practices not only need to be recognised but an awareness of the fundamental responsibilities towards others in the workplace needs to

be inculcated. Involvement by everyone in safe working practices creates an environment for improvement in quality. When processes such as injection moulding and sheetmetal forming are taught, the use of a flowchart may be appropriate. Variables in such processes need to be identified and possible causes can be analysed to ensure quality in the finished product. Similarly, the comparison of heat treatment processes may involve many variables. These could be examined in terms of correlation analysis in order to show direct relationships in a process. The knowledge of production machines, capacity and sequence planning lends itself to explaining some basic elements of a JIT (Just-in-Time) system such as quick changeovers, linked processes and pull systems of scheduling.

The involvement of students in problem-solving and improvement is fundamental in the approach to integrating quality. Other applications should be developed with the expertise of lecturers in the particular subject. The principles are applied during practical skills acquisition sessions in order to create a change in attitude towards quality and improvement.

A typical workshop practice syllabus follows.

SUBJECT: Workshop Practice TIME: 72 hours

Aim: To enable students to develop an appreciation of the capabilities and limitations of hand and machine tools commonly used in an engineering workshop and to be able to work safely in a workshop environment.

Objectives: At the completion of this subject, the student should be able to:

1. Use and operate hand and machine tools to produce simple components.

2. Use a selected range of common measuring tools and describe the most appropriate for a given task.

3. Identify various arc and oxy-acetylene welding processes and specify the type of equipment and materials necessary to successfully produce a satisfactory joint.

4. Observe all safety practices and be responsible towards other workers when using equipment.

5. Describe the principles and methods of moulding, pouring and fettling ferrous and non-ferrous castings.

6. Discuss the processes of injection moulding and sheet-metal forming.

7. Compare and describe heat treatment processes for ferrous metals.

Topics:

1. Safety procedures and accident prevention.

2. Measuring tools, equipment and techniques.

3. Hand tools and fitting techniques.

4. Lathes; surface finish, tolerances, feeds and speeds, tool materials and geometry taper turning.

5. Hole production; drilling, boring, seaming.

6. Heat treatment equipment and processes.

7. Production machines; capacity and sequence planning.

8. Press work; die sets and operations.

9. Plastics; injection moulding, materials and processes.

10. Welding; arc, oxy-acetylene.

11. Foundry; moulding, patterns, cores, pouring, fettling.

12. Sheetmetal; joining, machines.

CURRENT CURRICULUM WITHOUT 'QUALITY' CONCEPT.

TITLE:

TIME: (Lecture/Tutorials) 72 hours

Communication

AIM:

To enable the student to communicate effectively in social and industrial situations; to identify and rectify communication problems; to write with clarity of purpose and formally present information to groups and individuals; to appreciate the extent and function of communication within the lives of individuals and society.

OBJECTIVES:

At the completion of this subject, the student should be able to:

Create a model that illustrates the elements and processes of communication.
Identify communication barriers from psychological and social models and describe means of reducing the barriers.
Define self concept in relation to development, attitudes, perception learning and self confidence.
Use language in written and verbal forms that reduce ambiguity.
Explain how acceptance and empathy contribute to the development of trust; how defensiveness interferes with effective communication and demonstrate behaviours that help reduce defensiveness in communication.
Analyse an argument for logical reasoning and fallacies.
Write a job description and prepare for a job interview.
Prepare and present a 20 minute seminar using visual aids.
Define the term organisation and distinguish between formal and informal organisational structures and vertical and horizontal communications.

TOPICS:

Communication models
Self concept; values, attitudes, prejudice, perception, barriers; self confidence, learning, language, writing.

Group processes, conflict resolution, meetings, public speaking, seminar presentation, visual aids, job application, interview, argument logic, changing attitudes.

Organisations, structures in society, bureaucracies, mechanism of change and control. Communication patterns.

REFERENCE BOOKS:

A. Taylor
"COMMUNICATING"
Prentice Hall New Jersey 1980

ASSESSMENT:

Continuous assessment:

Assignments, interviews, essays	40%
Seminar presentation	20%
Final project	40%

Ways to integrate quality into Communication

The Communication subject has been selected to illustrate how quality can be integrated into the syllabus. The approach is to review the current syllabus in view of the key principles of Quality Management and make additions or changes to behavioural objectives in order to integrate quality. An excerpt from *Doing Things Right* sums up why quality should be integrated:

> 'Show me a quality problem and I'll show you a communications problem.' (Ruxton 1984, p.3).

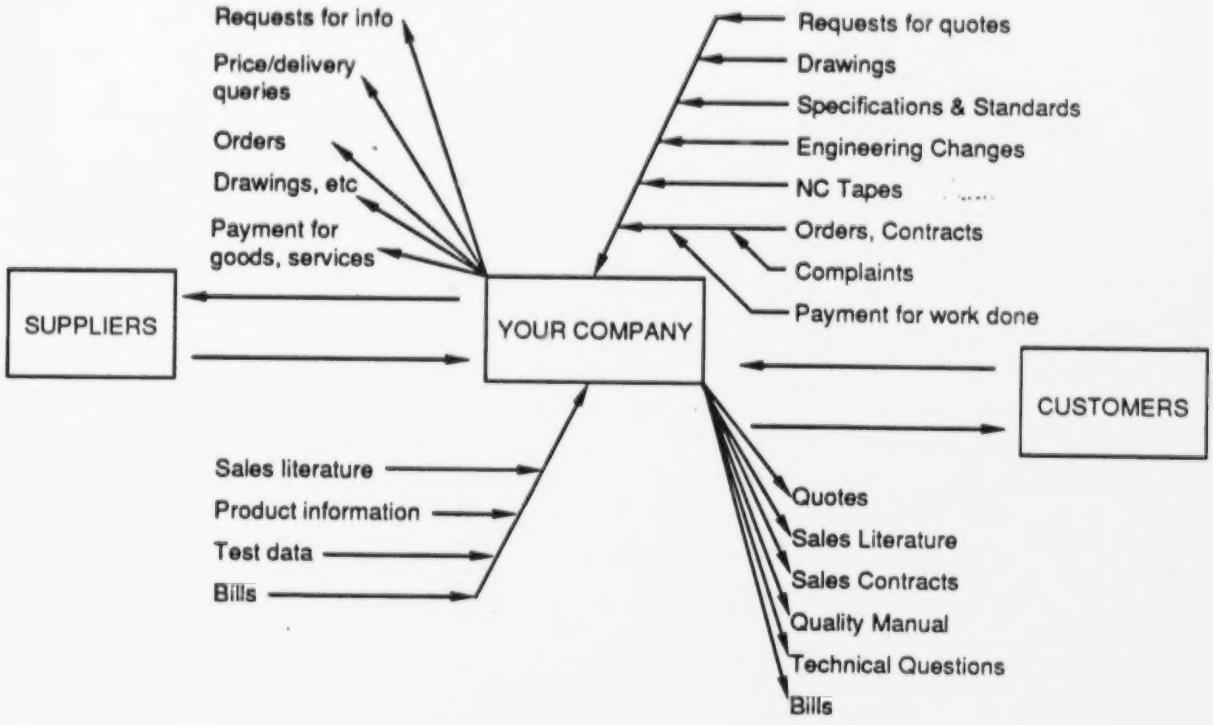
Communication is vitally important in managing for quality and improvement. Aspects such as employee involvement, problem-solving, teamwork, providing customer service, data collection and statistical quality control require effective ways of communicating to achieve results. In large companies communication channels can be complex with paperwork, procedures, and many transactions all likely causes of waste and error. The barriers to effective communication and quality need to be removed.

The small company which probably accounts for 80% of Australian industry has a significant advantage in initiating and maintaining a quality strategy. This advantage is enhanced communication within a simpler structure with fewer people.

Figure 6.7 shows that communication patterns can be quite complicated. (Ruxton 1984, p.6).

In a quality management system the communication process must not only be precise but complete. The mechanical engineer within any organisation needs to be able to communicate effectively to improve quality of products and processes.

FIGURE 6.7: Every communication represents an opportunity for error that can affect quality — be precise and complete (Ruxton 1984).



It is suggested that additional behavioural objectives related to quality should be included in the communication subjects e.g.:

- show relationships between internal and external customers;
- understand and communicate customer needs;
- participate in problem-solving using employee involvement approach as with Quality Circles;
- identify systems in which communication must take place;
- brainstorm communication problems at work;
- use cause and effect analysis to determine barriers to communication;

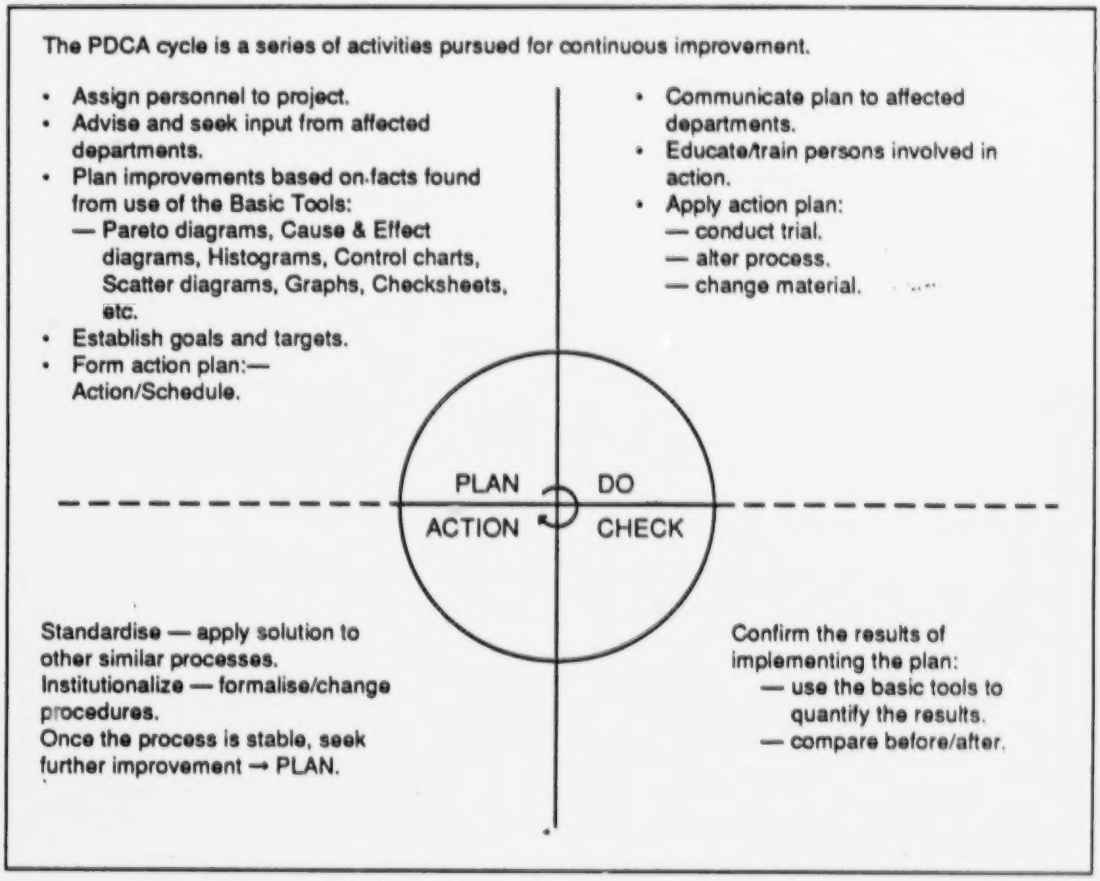
- effectively communicate information in a management presentation;
- recognise the limitations of written reports in achieving action;
- recognise and accept differing opinions of people and reach group consensus on a problem;
- develop effective ways of downward communication;
- show strategies for encouraging upward communication;
- understand role of engineer in communicating quality and improvement action plans;
- use tools of TQC as visual aids in a presentation;
- understand how traditional organisation structures limit effectiveness of communication;
- understand effective ways of collecting data through communication, interviews, questionnaires and surveys.

As Robson succintly writes:

> To achieve effective two-way communication requires much more than a technique. To have an open relationship with an individual requires more than the ability to speak; it requires that we believe we will be listened to, that we have confidence that what we say will not be used against us, that we believe the other party has a genuine interest in what we have to say, and so on. (Robson 1988, p.34).

Effective two-way communication is not easily achieved without the right environment in an organisation. Activities such as quality circles, improvement teams and task groups are the means by which communication can take place. It is essential that students are conversant with this process of communication. A suggested approach within the syllabus is to use the problem-solving technique of quality circles as a medium for communication. One of the most frequently cited problems in the workplace is communication. Why not use this subject for problem-solving and interaction. The PDCA Model could be used incorporating basic techniques of problem-solving. (Figure 6.8).

FIGURE 6.8: PDCA Problem-solving cycle


The PDCA cycle is a series of activities pursued for continuous improvement.
• Assign personnel to project.
• Advise and seek input from affected departments.
• Plan improvements based on facts found from use of the Basic Tools:
— Pareto diagrams, Cause & Effect diagrams, Histograms, Control charts, Scatter diagrams, Graphs, Checksheets, etc.
• Establish goals and targets.
• Form action plan:— Action/Schedule.
• Communicate plan to affected departments.
• Educate/train persons involved in action.
• Apply action plan:
— conduct trial.
— alter process.
— change material.
PLAN
DO
ACTION
CHECK
Standardise — apply solution to other similar processes.
Institutionalize — formalise/change procedures.
Once the process is stable, seek further improvement → PLAN.
Confirm the results of implementing the plan:
— use the basic tools to quantify the results.
— compare before/after.

The key principles of quality should be the basis for curriculum development in the A.D.M.E.

. MANAGING FOR QUALITY AND IMPROVEMENT to be a core subject.

. Quality to be integrated into all subjects.

. Curriculum developers and lecturers in Mechanical Engineering to develop curricula suitable for integrating into subjects.

. Staff training to be provided in quality principles and concepts.

. Relevant research findings should be referred to in selecting components for syllabus.

. Particular focus should be on customer needs now and in the future. Industry and students needs are primary to curriculum development in quality.

6.3 SHORT COURSE IN HOTEL BAR SUPERVISION

The approach to quality in the service sector requires a different focus and emphasis from that of the manufacturing industry.

> To apply quality control most effectively to service industries requires an analysis of the unique characteristics of service operations, the role of the buyer as well as that of the seller, and the application of appropriate quality concepts and techniques. (Rosander 1985, p.3).

Some significant differences in service industries are:

- customer requirements are more often human factors rather than product characteristics;
- errors, delays, failures and dissatisfaction are priority quality concerns;
- usually there are no specifications in writing, as in manufacturing;
- quality control deals with standards according to law, legislative acts and prescribed procedures;
- lack of formal quality control systems;
- many more direct transactions with customers;
- customer complaints usually handled at the time and involve understanding, courteous behaviour and action to satisfy or minimise level of dissatisfaction;
- often large volumes of paperwork e.g. banks, offices, government agencies;
- lack of control over customers and variation in their expectations and wants at the time e.g. restaurants, hotels, hospitals;
- large numbers of ways of making human errors.

The curriculum in quality must make appropriate recognition of these differences. Some terminology used widely in manufacturing needs to be altered or understood by service

industries. The key principles are consistent within all industries even though the application may be quite different. Rosander (1985) provides an extensive listing of the applications for quality in the service industries.

The industry survey responses for supervision in the hospitality/tourism industry (Figure 6.9) varied considerably from those of the manufacturing industry. The pareto of essential skills indicated the importance of the human relationship components in the industry, the priorities being interaction skills (100%), customer service (91%), employee involvement (90%), leadership skills (89%), problem-solving (89%), and concepts of quality management (78%).

Poor responses to statistical quality control (40%), data collection (38%) and total quality control (28%) showed that hospitality/tourism did not fully understand the applications of TQC in their industry. This demonstrates an immediate need to clarify terminology so that principles can be understood. "Quality of Service", "Service Excellence", "Service Improvement", "Customer Service" are terms which may not adequately express the total approach to managing for quality and improvement which is implied within the key principles.

The continuum of quality characteristics (Figure 6.10) in the survey showed that future needs of hospitality and tourism are similar to manufacturing.

Why integrate quality into a hotel bar supervision course?

A short course has been selected with a range of topics which are relevant to quality and improvement. The course is not accredited as such, but the topics are the basis of Associate Diploma and Advanced Certificate subjects within the hospitality area in Australia. The integration of quality will have general application to other courses. This is a practical course with significant implications for all hotels, clubs and, to a lesser extent, restaurants.

FIGURE 6.9: Hospitality industry
Industry Responses to essential levels of importance of skills for managing for quality and improvement for SUPERVISORY STAFF

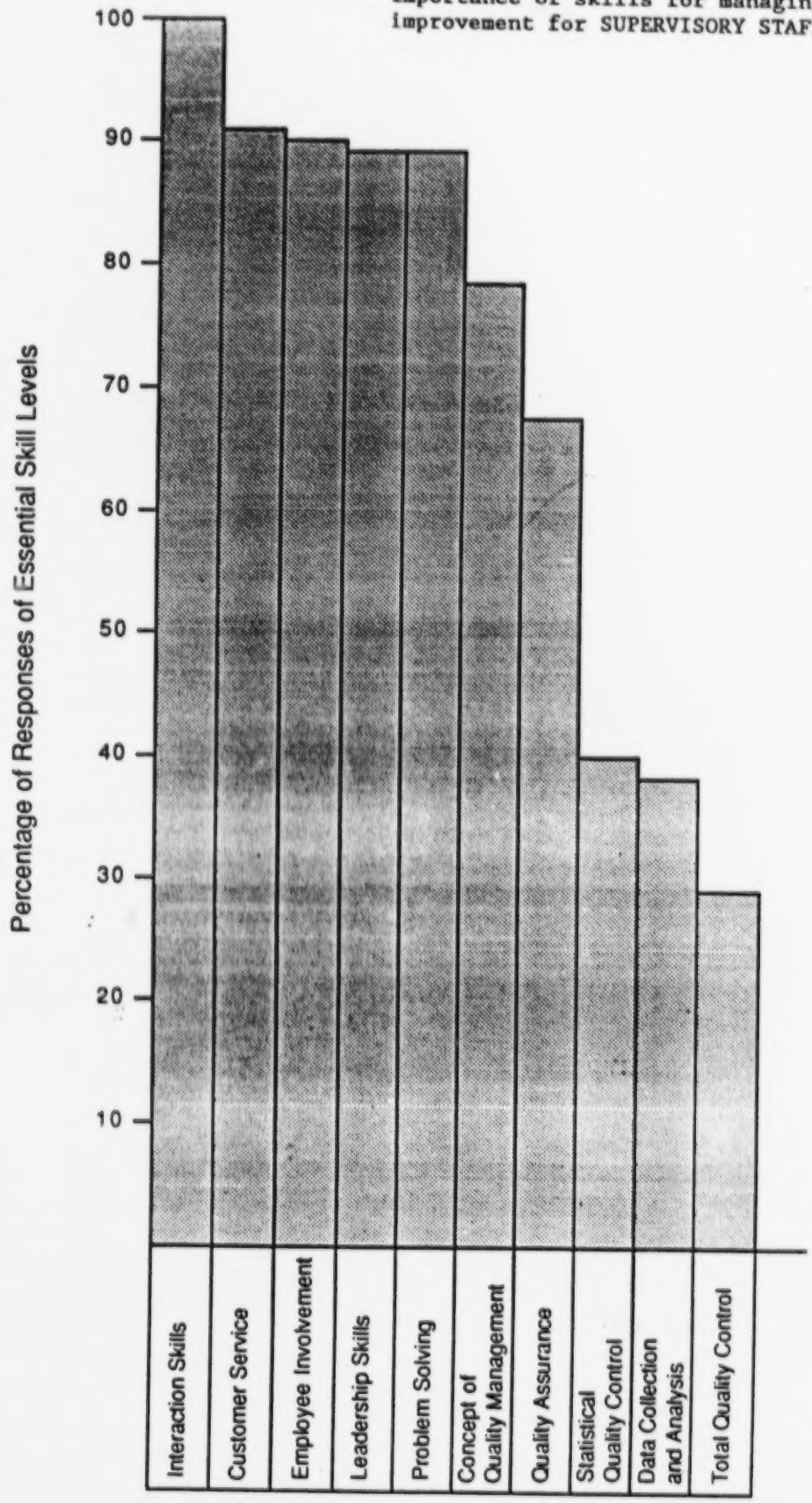
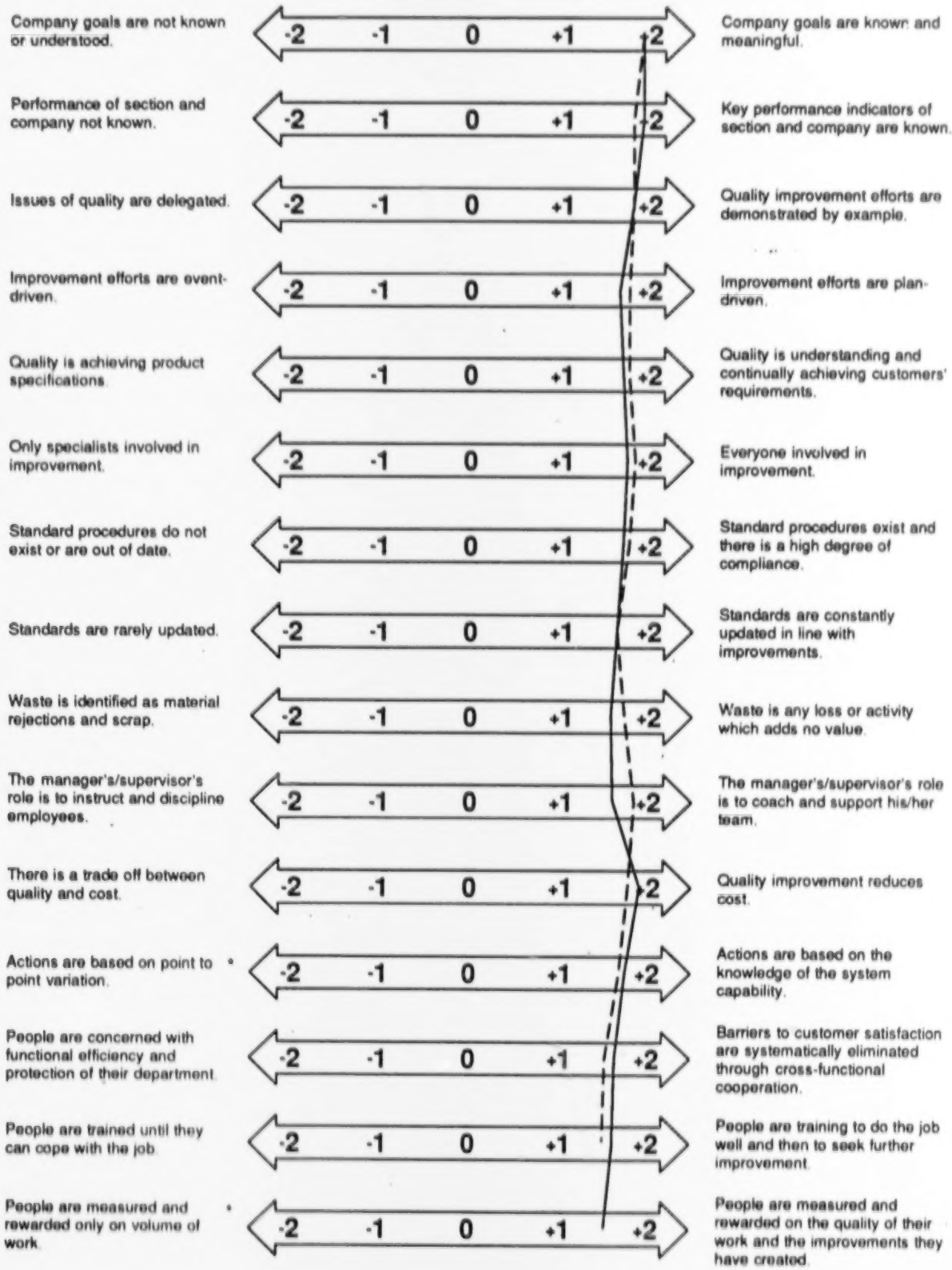


FIGURE 6.10 Comparison of the average expected quality practices (two years hence) between the manufacturing and tourism/hospitality industries surveyed.


Company goals are not known or understood.
Company goals are known and meaningful.
Performance of section and company not known.
Key performance indicators of section and company are known.
Issues of quality are delegated.
Quality improvement efforts are demonstrated by example.
Improvement efforts are event-driven.
Improvement efforts are plan-driven.
Quality is achieving product specifications.
Quality is understanding and continually achieving customers' requirements.
Only specialists involved in improvement.
Everyone involved in improvement.
Standard procedures do not exist or are out of date.
Standard procedures exist and there is a high degree of compliance.
Standards are rarely updated.
Standards are constantly updated in line with improvements.
Waste is identified as material rejections and scrap.
Waste is any loss or activity which adds no value.
The manager's/supervisor's role is to instruct and discipline employees.
The manager's/supervisor's role is to coach and support his/her team.
There is a trade off between quality and cost.
Quality improvement reduces cost.
Actions are based on point to point variation.
Actions are based on the knowledge of the system capability.
People are concerned with functional efficiency and protection of their department.
Barriers to customer satisfaction are systematically eliminated through cross-functional cooperation.
People are trained until they can cope with the job.
People are training to do the job well and then to seek further improvement.
People are measured and rewarded only on volume of work.
People are measured and rewarded on the quality of their work and the improvements they have created.
-2 -1 0 +1 +2

MANUFACTURING:_____ TOURISM/HOSPITALITY:.....

**Deleted from Tourism/Hospitality Profile.*

The relevance of quality to the course should be critically evaluated so that it meets industry needs. The model course chosen, Hotel Bar Supervision, aims to develop curriculum guidelines for the integration of quality into short courses in the hospitality industry.

The goal will be to fully integrate quality into the course. The total integration of quality into courses such as Hotel Bar Supervision will undoubtedly be a key to the elimination of waste and variation and the improvement in service and quality in service industries.

Figure 6.11 illustrates a method of integrating quality into specific topics of the Hotel Bar Supervision course.

Course structure

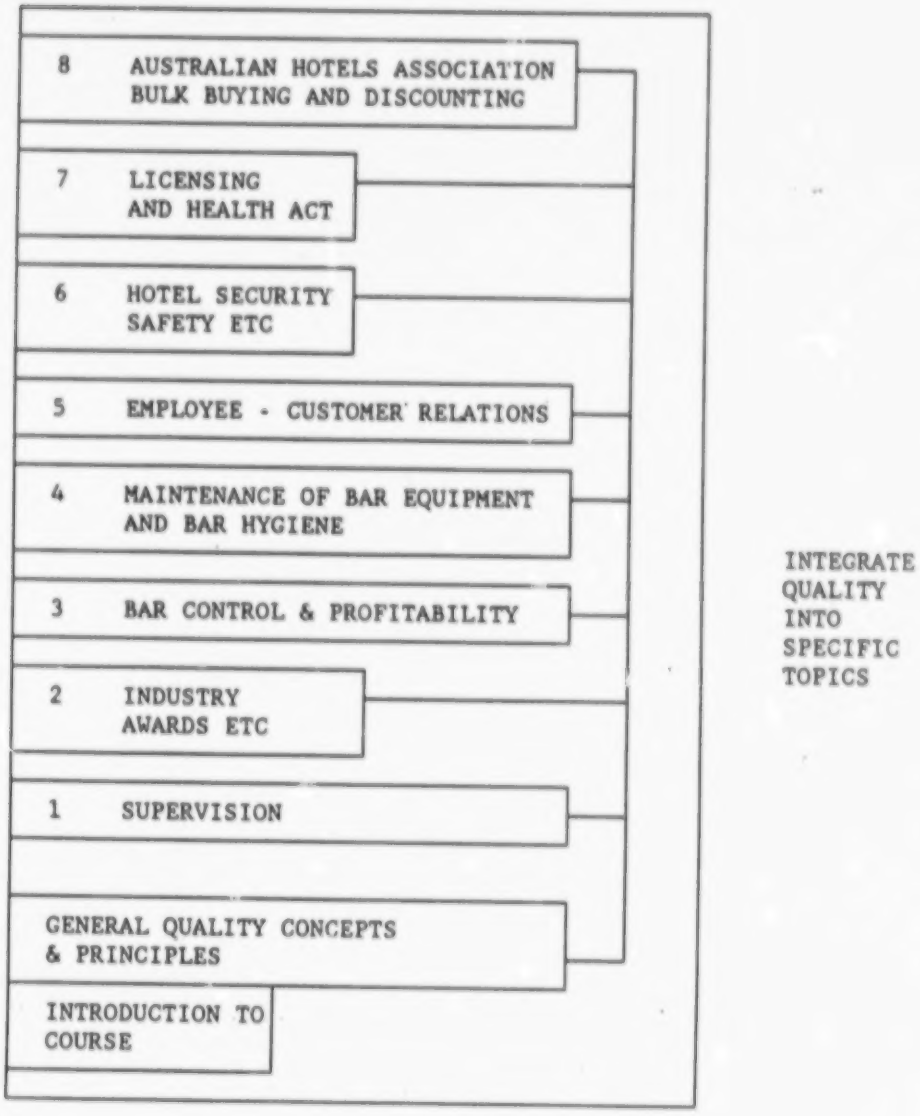
The course HOTEL BAR SUPERVISION is offered by the School of Hospitality and Tourism, Adelaide College of TAFE. The course length is 50 hours, spread over 12 weeks. The prerequisite for the course is the completion of a TAFE Hotel Bar Service course or experience as a bar attendant.

The course is arranged so that students will gain the knowledge necessary to investigate methods of control and supervision that apply to service, materials, staffing, equipment and safety in a hotel/pub-type operation. Topics include:

- Hotel/club award interpretation.
- Profitability and cost control.
- Staff control and supervision.
- Equipment - care and maintenance.
- The Licensing Act.
- Security and safety procedures.
- The Australian Hotels Association and its role.

The topics provide an ample framework for integrating quality into the course. The course is designed for managers, supervisors and bar attendants. It may provide students with a desire to further studies at Advanced Certificate or Associate Diploma level courses in hospitality. More importantly, it has specific application at a "grass roots" level in any local pub/hotel operation in the industry.

FIGURE 6.11: Hospitality : Hotel Bar Supervision course structure


8 AUSTRALIAN HOTELS ASSOCIATION BULK BUYING AND DISCOUNTING
7 LICENSING AND HEALTH ACT
6 HOTEL SECURITY SAFETY ETC
5 EMPLOYEE - CUSTOMER RELATIONS
4 MAINTENANCE OF BAR EQUIPMENT AND BAR HYGIENE
3 BAR CONTROL & PROFITABILITY
2 INDUSTRY AWARDS ETC
1 SUPERVISION
GENERAL QUALITY CONCEPTS & PRINCIPLES
INTRODUCTION TO COURSE
INTEGRATE QUALITY INTO SPECIFIC TOPICS

Integrating quality into hotel bar supervision course

Quality service aims to provide competent, error-free performance, at an affordable price, on time, to satisfy customer requirements now and in the future.

There are many applications of quality management principles in hospitality. Rosander lists aspects of an entire operation to show the scope of quality improvement areas. The Hotel Bar operation includes factors such as:

Location:	accessibility, surroundings, parking.
Receiving:	controls, facilities, distribution and storage.
Kitchen:	layout, systems for handling orders, delay times, preparation time.
Service:	attitude, service times, variety of meals, prices. staff available.
Dining Room:	cleanliness, menu choices, atmosphere, waiting time.
Bar:	delays in service, type of bar, cost, variety, choice, bar attendant, attitude, expertise.
Food:	availability, hours, prices, variety, choice, table service, quality of food, atmosphere, attitude of staff.

The goal of quality service or performance should be to satisfy customers, serve customers with minimum delay, provide good quality food and beverages, show courtesy and consideration, listen to customers, resolve complaints and create an environment that encourages repeat business. A quality management strategy is directed towards meeting these goals and looking for improvements. The principles and concepts of quality management can be introduced as a separate component of any course and reinforced by applying the concepts to other topics. The Hotel Bar Supervision course includes 8 hours of key principles, concepts, tools and techniques. A typical syllabus is illustrated on the following page.

COURSE: HOTEL BAR SUPERVISION

SUBJECT: General Quality Concepts and Principles

Length: 8 hours

Prerequisite: To have had a minimum of 12 months hotel experience or 6 months hotel experience with a documented TAFE hotel bar course statement.

Terminal Objectives: On the completion of this subject the student will be able to:

1 recognise and understand key principles of quality management;

2 identify problems within a hotel bar situation;

3 use problem-solving techniques of brainstorming and cause and effect analysis;

4 understand and use data collection techniques;

5 establish customer requirements within hotel bar situations;

6 develop an appropriate plan for employee involvement in improving quality and service.

Topics:

1 Terms of quality management.

2 8 key principles of quality.

3 Data collection and analysis.

4 Brainstorming.

5 Cause and effect analysis.

6 Customer requirements.

7 Employee involvement.

The role of the hotel bar manager/supervisor is vital to the quality of service received by the customer. An understanding of the eight key principles of quality management is essential for effective management in the hotel bar service environment. The eight key principles of quality management and improvement should be integrated into all topics of the Hotel Bar Supervision course. The key principles are:

- *All systems exhibit variation*

  Some of the variables to be considered here will be waiting for service, availability of service products, levels of customer satisfaction, sales and profit figures and attitudes of staff. Understanding the systems and identifying common and special causes of variation is required for quality improvement.

- *Quality does not cost, it pays*

  Competent error-free service will reduce costs, provide customer satisfaction and thereby increase profit margins.

- *People work within systems*

  The attitude of management towards staff should be directed co-operation, employee involvement in decision-making, training and career development.

- *Everyone serves a customer*

  Everyone in the system is a customer of somebody else. It is the responsibility of the supervisor to create an environment of satisfactory interaction with both external and internal customers.

- *Improvement efforts should be plan-driven, not event-driven*

  Improvement strategies directed towards staff should include problem-solving, training, standardisation of processes and procedures and reliability of service.

- *Improvement should be a way of life*

  The supervisor should encourage staff to contribute ideas and share in decision-making and recognise that they are a valued asset in the quality of operation.

- *Management by facts and data*

  The supervisor needs to develop skills in the collection of facts and data to assist in problem-solving as it relates to quality, service, environment and staff attitudes in order that continual improvement be achieved.

- *Control the process, not the output*

  The standardisation and control of bar management is essential if quality and improvement are to be attainable goals. Basic statistical techniques can be used to control processes and procedures as applied to hotel bar management.

Curriculum developers and TAFE lecturing staff with an understanding of the principles of quality management can integrate the key principles at appropriate stages of the Hotel Bar Supervision course. The key principles are also adaptable to any course related to the hospitality industry.

7. TRAINING PACKAGES

7.1 INTRODUCTION

The purpose of this part of the project was, in part, to illustrate the types of materials that would be suitable for teaching modern quality concepts in existing TAFE courses. It was agreed that three training packages should be prepared. (Further packages could be prepared in 1989 as part of a subsequent project, based on the curriculum framework and sample packages produced in this project.)

The following three packages were prepared as part of this project:

- Package 1 - the key principles of quality;
- Package 2 - the key quality principles applied to office administration;
- Package 3 - the key quality principles applied to manufacturing.

The two case studies in Packages 2 and 3 cover the tools of TQC.

Each package consists of:

- a teaching guide (with materials);
- a student guide;
- a 14 to 24 minute video.

The packages provide about 15 hours of instruction, and may be used in a variety of ways.

7.2 STRUCTURE OF THE PROGRAMME

The programme comprises three videos, a Teacher's Guide, visuals for conversion into overhead projector slides and Student Notes, and are presented in full in Appendix E.

The first video features the Chairman of the NIES Quality Forum - Education Task Group, Norbert Vogel (Manager, Quality Development, Broken Hill Proprietary Co. Ltd).

Norbert Vogel presents a definition, eight principles and four requirements for establishing quality management in an organisation such as BHP.

Following Norbert Vogel's presentation the video is divided into eleven scenes and introduces a team of actors representing the senior management of a medium sized company. They identify a cash flow problem and decide to tackle it using Quality Management.

The second video shows them tackling their problem and introduces flow diagrams, Ishikawa diagrams, run charts and Pareto analysis. There are four scenes in this video.

In the third video, a production problem is identified. This is undertaken by systematic data collection and analysis. Techniques for systemic data collection and analysis, construction of frequency tables, histograms, calculation of averages, standard deviations, systems within and outside statistical control and capability of systems are covered. There are four scenes in this video.

The credits for the entire production are at the end of the third video.

7.3 LAYOUT OF THE TEACHER'S GUIDE

The Teacher's Guide is designed so that everything required for use in each section is immediately at hand.

Each of the scenes, eleven in Video 1, four in Video 2 and four in Video 3, end with the caption:

BREAK FOR DISCUSSION.

For each scene there is:

- an outline of the teaching objectives for the scene;
- a detailed lesson plan including suggestions for the words to be used;
- visuals for conversion into OHP slides when there are any;
- a copy of the Student's Notes for that scene.

At the back of the Manual there are copies of all the visuals for conversion into OHP slides and a complete set of Student Notes for photocopying and distribution to all students.

7.4 HOW TO USE THE VIDEO TRAINING PACKAGE

Preparation

The teacher will require:

- a video player, VHS or Beta;
- chalkboard, white board or flip chart;
- a set of visuals converted into OHP slides, transparencies or acetates - whichever is preferred;
- a complete set of Student Notes for each member of the class.

Teaching the programme

There are clearly defined teaching objectives for each scene in the video. These appear immediately after the script. The teacher may construct his/her own programme around the teaching objectives. The material may be fairly new to some teachers. Time for learning the material and lesson preparation may not be available, and a Teacher's Guide was therefore provided. The Guide contains suggestions on what the teacher should <u>say</u> (the boxed sections) and <u>do</u> (the unboxed sections). This is accompanied by supporting diagrams and student notes.

We are confident that the ideas contained in the programme can have a great impact on Australia and its international economic competitiveness.

This programme is one step towards the dissemination of ideas to Australian industry.

8. WORKSHOPS

The industry survey (Chapter 3) highlights the need for TAFE colleges to become active in the transmission of quality skills to the community.

Industry requirements, as identified in the survey, indicate that TAFE support and action in the implementation and maintenance of successful quality management and improvement strategies is of the utmost importance. There is a need for TAFE curriculum developers to integrate quality management and improvement into TAFE courses.

To assist TAFE in the overall quality implementation strategy, a series of workshops is planned for June and July 1989. The aim of the workshops is to provide awareness within TAFE of the essential need for the integration of quality into all vocational education programmes. The workshops will also describe suitable strategies for integration. Of one-day duration, the workshops will be conducted in Brisbane, Sydney, Melbourne, Adelaide and Perth, subject to demand.

Publicity for the workshops will be distributed to the eight TAFE authorities in Australia. The TAFE National Centre for Research and Development will co-ordinate the workshops. It is planned that persons with expertise in modern quality philosophies and practices play an integral role in the workshops.

The workshop is designed for teaching staff, with curriculum development responsibilities, and 'quality champions'. In order to make an impact on TAFE it is suggested that each TAFE college and/or school appoint a quality champion. Dr J. Juran describes a champion as a person that will lead and inspire others in the concept of quality management and improvement.

The concept of champion can be adopted by TAFE by nominating a key person to co-ordinate and support the integration of quality into courses. The college/school champion should, if possible, be someone with expertise in quality, or a person who is prepared to devote time to developing quality skills.

As stated in Chapter 4, a champion should be a person who:

- understands the principles of modern quality management and improvement;
- is committed to the integration of quality into TAFE vocational programmes;
- has good inter-personal skills and may therefore be an effective 'change agent'.

Quality champions may, for example, be College Principals/Directors.

Curriculum development staff are also, of course, extremely important to the overall process of integrating quality into vocational education programmes. The workshops, therefore, will be directed towards the nominated quality champions and TAFE curriculum developers.

To assume that a one-day workshop will be of sufficient length to develop the required skills in quality is perhaps unrealistic. The aim will be to promote enthusiasm in the champions in the hope that they will return to their colleges/schools with the determination to convince all staff that the integration of quality into courses is imperative. The champions will, in the workshops, acquire an understanding of the use of the training packages developed for this project and will be encouraged to conduct workshops for their colleagues.

It will be to the advantage of the colleges/schools that the champion develop a rapport with quality experts and quality organisations. This strategy will ensure that modern philosophies will continually be available to TAFE lecturing staff.

The workshops will also emphasise the value of the specially developed training packages for the integration of quality into vocational education programmes.

A suggested programme for a typical workshop appears in Table 8.1.

TABLE 8.1: Workshop Programme:

INTEGRATING QUALITY CONCEPTS INTO TAFE COURSES

Duration:	8 hours
Participants:	TAFE 'Quality Champions', Curriculum Developers, and teaching staff.
9.00 a.m.	Introduction.
9.05 a.m.	Background (see Chapter 1).
9.15 a.m.	Philosophy (see Chapter 2).
9.45 a.m.	Training package No. 1.
10.15 a.m.	Discussion.
10.30 a.m.	Morning coffee.
10.45 a.m.	Implications for curriculum developers.
11.15 a.m.	Curriculum components.
11.45 a.m.	Group sessions on quality curricula for specific areas.
12.30 p.m.	Plenary session: Groups to report.
12.45 p.m.	Lunch.
2.00 p.m.	Review of morning sessions.
2.20 p.m.	Training Package No. 2.
2.50 p.m.	Discussion.
3.00 p.m.	Afternoon coffee.
3.15 p.m.	Training Package No. 3.
4.05 p.m.	Discussion.
4.30 p.m.	Panel Session.
5.00 p.m.	CLOSE.

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APPENDIX A: THE PROJECT ADVISORY COMMITTEE

The Project Advisory Committee ecomprised:

Chairman:
Mr Norbert Vogel
Manager, Quality Development
The Broken Hill Pty Ltd

Mr Robert Burke
Manager, Quality Programmes
South Australian Centre for Manufacturing Pty Ltd

Ms Joan Kennedy
Director, Industry Liaison Unit
Tertiary Projects & Review Branch
Department of Employment, Education and Training
CANBERRA

Mr Graeme Priestley
Assistant Director
NIES Quality Programs
Department of Industry, Technology and Commerce
CANBERRA

Mr David R. Scarfe
Deputy National President, AOQC
Manager, Quality Assurance
Lawrenson Diecastings Pty Ltd

Mr John Swan
General Manager
Vocational Education & Training
Department of Employment, Vocational Education and Training
QUEENSLAND

Mr Brian Thomas
Manager, Human Resources Department
Australian Telecommunications Commission

The ACTC representative:
Mr Viv Caulfield
Director (Studies)
Department of Employment,
Vocational Education and Training
QUEENSLAND

The TAFE Quality Project leader:

Mr Geoff Hayton
Senior Research and Development Officer
TAFE National Centre for Research and Development Ltd.

The first seven members of the committee listed above comprise the NIES Quality Forum - Education Task Group. The Chairman of the Education Task Group is Norbert Vogel.

APPENDIX B: EXISTING QUALITY COURSES

Quality courses designed for specific purposes - Quality Control and Assurance for example, are currently offered in many Australian states. The courses vary in length and appear to be entirely related to the area of manufacturing. Very few, if any, quality courses exist in basic trade apprentice courses. Given that quality training is of the utmost importance for the Australian economy there appear to be no quality courses aimed specifically at top management.

The industry survey did reveal that some companies do conduct in-house courses for management in the form of either weekend, or one week seminar-type courses.

Quality organisations also make available to industry, specific quality courses and these often make use of TAFE facilities and lecturers to assist with the courses.

The table on the following pages appears in a report prepared by Mr Errol Cresshull, Deputy Head, School of Mechanical Engineering, Regency College of TAFE, South Australia. The table,as part of this Appendix, is intended to be read as a guide to the availability, or lack of, quality courses.

A Quality Management Resources Project conducted by the Queensland Department of Employment, Vocational Education and Training (DEVET) prepared an up-to-date listing of quality courses available in Australia. The project was funded by the Australian Committee for TAFE Curricula (ACTC), and the report was prepared in May 1989.

It is also apparent that the need for the integration of quality into all TAFE vocational education programmes is being recognised as imperative to the Australian economy. A nucleus of students graduating from vocational courses with integrated components of quality will provide industry with the skills to ensure that any industry-introduced quality programmes will be successful.

COURSES AND SUBJECTS SPECIFICALLY ORIENTATED TO QUALITY CONTROL

STATE	SUBJECT OR COURSE	DURATION	SOURCE	LOCATION	ENROLMENT (PER YEAR)	COMMENT
A.C.T.	Nil					
N.T.	Nil					
TAS.	Nil					
QLD.	Nil					
W.A.	QC Management Short Course	27 hours	AOQC	Carine) Bentley) Fremantle)	64	Introduced 1984
S.A.	Quality Control	108 hours (E)	Prod Eng C in T	Regency Park	14 average	Total course 1476 hours
	Short Course	6-33 hours	AOQC	Regency Park	NA	"Well supported"
	Quality Control	62 hours	Special Course	Panorama	NA	
VIC.	Complete Course	288 hours	Further COT in QC	Swinburne Footscray	22 average 15	Introd. recognised 1982 by Introd. IQA 1984
	Prod. Liab & Recall Mgt.	36 hours (E)))	Manufacturing Eng COT	Swinburne)	20)	(Introd. 1984) (Total course 1080 hrs
	Org. & Mgt. for Quality	36 hours (E)))		Footscray)	NA)	(Total course 1080 hrs (Common with Further (COT
	Reliab. & Prototype Test	36 hours (E)))				(Recognised by IQA
	Human factors	36 hours (E))				
	Quality Control	36 hours (C)	Cer. of App. Sci. Dye Chem.	Tech. Schools	NA	
	Quality Control	36 hours (each) (C)	Cer. of App. Sci. Food Proc.	Tech. Schools	NA	
	Quality Control & Assurance	42 hours (C)	Cer. of App. Sci. Dairy Tech.	College of Agric. & Hort.	NA	
	Qual. C. in Printing	30 hours	Special Course	Melb. Coll. of Print & Graph. Arts	16 (average)	6 hours x 5 days

SUBJECTS SPECIFICALLY ORIENTATED TO QUALITY CONTROL
(contd.)

STATE	SUBJECT OR COURSE	DURATION	SOURCE	LOCATION	ENROLMENT (PER YEAR)	COMMENT
N.S.W.	Total Quality Control	72 hours	Post Certificate	Sydney	18	Intro 1985)Adult entry
	Quality Assurance	72 hours	Post Certificate	Sydney	12 (1985)	Intermittent) is common
	Quality Assurance	72 hours (C)	Chem. Higher Cert	Sydney Newcastle	10 ave	Total course 720 hours
	Quality Control	69 hours (C)	Pharm. & Cosmetic Tech. Post Cert.	Sydney	25 ave	Total course 324 hours
	Quality Assurance I & II	72 hours (C)	Text. Higher Cert	Strathfield	8 (1983)	Intermittent Total course 666 to 684 hours Recognised by IQA
	Quality Control	54 hours (C)	Prod. Eng. Cert.	Sydney Granville St. George Newcastle	50 ave	Total course 1449 hours
	Quality Control	27 hours (C)	Electrolytic	Sydney	10 (1985)	Intro 1985-total course 972 hours
	Textile Quality Control	72 hours (C)	Textile Cert.	Strathfield	9 ave	Total course 1500 hours
	Textile Quality Evaluation	72 hours (C)	Text. Design Cert	Strathfield	16 (1983)	Intermittent. Full-time Total course 2196 hours
	Printing Quality Contr	72 hours	Special Course	Sydney	Dormant	Under review
	Quality Cont. for Laund. & Dry Cleaners	54 hours (C)	Laundry & Dry Clng. Supervision	Strathfield	8 ave	Under review Total course 216 hours
	Textile Qual. Control	24 hours (C)	Textiles for commence	Strathfield	9 ave	Intermittent
	Refresher Course for QC Engineers	54 hours	Short Course	Newcastle	41 (1985)	Introd. 1985 for AOQC
	Basic Quality Control	72 hours	QC & Eng. Insp. course	Sydney	25 ave	Total course 180 hours

C = CORE E = ELECTIVE NOTE: Statistics & Measurement subjects not listed

APPENDIX C: EXISTING QUALITY RESOURCES

A listing of quality management resource material is being prepared by the Queensland Department of Employment Vocational Education and Training (DEVET)and is called:

Quality Management Resources Project.

The project was funded by the Australian Committee on TAFE Curricula.

Lists of the holdings of print and non-print resources, appropriate to TAFE quality courses have been collected from:

- Australian tertiary institutions;
- TAFE institutions;
- industry organisations;
- relevant state government departments.

The quality resources collected have been categorised under the headings of:

- Process Control
- Quality Control
- Quality Management
- Quality Assurance
- Quality Circles
- Quality Improvement
- Standards (Quality)

To further assist TAFE curriculum developers and lecturing staff, curriculum topics will also be categorised as:

Curriculum Topics	Sub-Topics
. Planning	
. Systems Control	Systems Management Information Systems Inventory Control Capability Analysis
. Statistics	
. Communications	Skills relevant to participation in Quality Circles
. Reliability	Measurement, Testing Sampling, Reliability Maintainability Standards
. Management Analysis	Cost Analysis Economic Analysis Problem-solving
. Productivity	Process Control Manufacturing Marketing (Competition) Design Quality Improvement
. Establishing a Quality System	

To complement the above categories, TAFE study areas will be included in the resource package, e.g.:

- Engineering
- Manufacturing
- Construction
- Applied Science
- Business Studies
- General

More than 600 resource materials relating to quality have been collected. The Queensland project team make the following observations with regard to the material:

- most resources fall under the headings of management, manufacturing, engineering, quality circles and general theories.

- business, marketing and service industry resources are virtually non-existent.

- many resources are in the category of teacher resource books.

- there appears to be a need to develop "TAFE level" resources, that is, for application of quality principles to specific tasks; for development of communication skills for participation in quality circles; for application in statistical studies; for control of variability and its effect on cash flow and profitability; and banks of case studies.

- it is taking some considerable time to annotate and recommend utilization of the resources listed to date, not only because some resources are held by private organisations, but also because of the need to identify and establish <u>how</u> quality principles are to be expressed in TAFE curriculum as topics, behavioural objectives and basic skills units.

To ensure that the Queensland project remains a valuable quality resource, listings will need to be continually monitored and reviewed. The review of resource material will allow for the addition of newly developed quality resources in what is proving to be a growth area in Australian industry.